Sept. 4, 1945. H. B. VROOM 2,384,220

COUNTER

Original Filed July 4, 1941

Fig. 1.

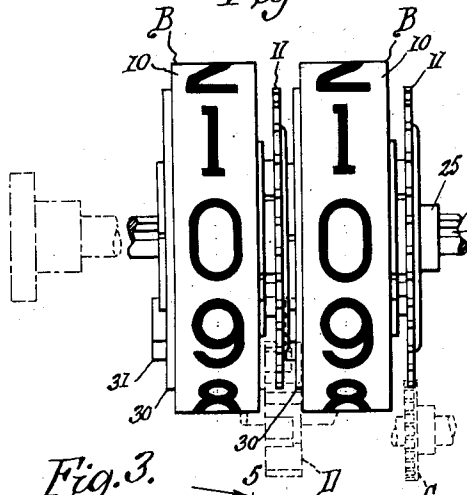


Fig. 2.

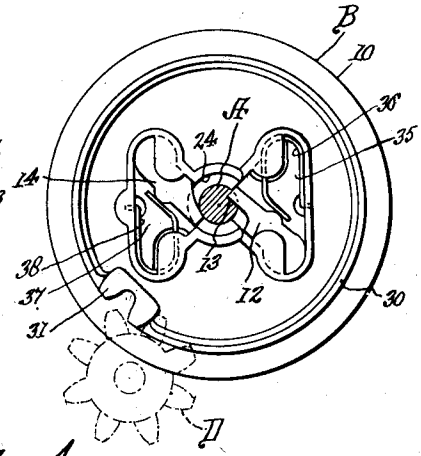


Fig. 3.

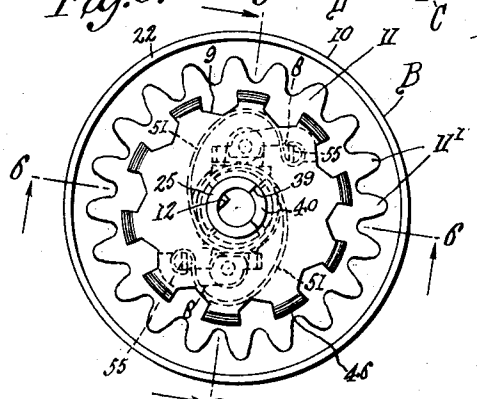


Fig. 4.

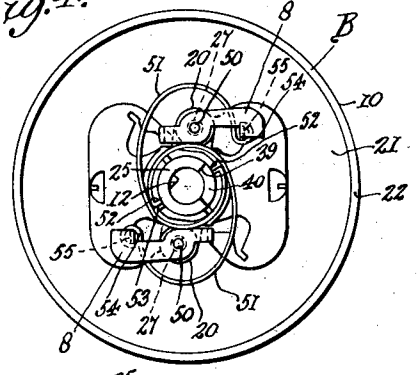
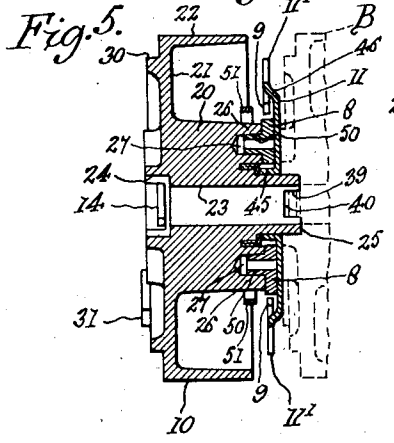


Fig. 5.



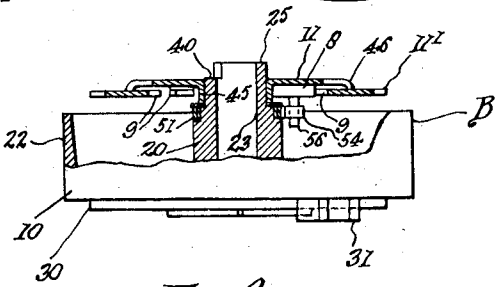


Fig. 6.

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UNITED STATES PATENT OFFICE

2,384,220

COUNTER

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Original application July 4, 1941, Serial No. 401,061, now Patent No. 2,358,780, dated September 26, 1944. Divided and this application May 22, 1943, Serial No. 488,017

10 Claims. (Cl. 235—1)

This invention relates to a counter of the type having a plurality of counter units of successively higher orders, each unit including a numeral wheel, a driven gear, and a pawl and ratchet therebetween whereby, during a registering operation, the gear and numeral wheel may be driven as a unit and, during the resetting operation, the numeral wheel may be reset to a starting position without transmitting rotation to the gear.

This application is a division of my application Serial No. 401,061 filed July 4, 1941, now Pat. No. 2,358,780, granted Sept. 26, 1944.

An object of the invention is to provide an improved counter unit which is characterized by its simplicity in construction, its economy in manufacture, and the ease and facility with which the parts may be assembled; also, by its effectiveness in operation and by its durability.

A more particular object of the invention is to provide a counter unit having an improved pawl and ratchet arrangement of a simplified and economical construction and which will permit the parts to be cheaply made and readily assembled.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements, and arrangement of parts which will be exemplified in the construction hereafter set forth and the scope of the application of which will be indicated in the appended claims.

In the accompanying drawing, wherein is shown one embodiment which the present invention may take:

Figure 1 is a front view of a counter embodying the invention herein;

Fig. 2 is an elevational view looking towards the left hand side of a counter unit as viewed in Fig. 1;

Fig. 3 is an elevational view looking at the other side of a counter unit and which side is provided with a combined ratchet wheel and driven gear member;

Fig. 4 is a view similar to Fig. 3 but with the combined ratchet wheel and driven gear member removed;

Fig. 5 is a sectional view of one of the units taken substantially on line 5—5 of Fig. 3; and

Fig. 6 is a sectional view of one of the units taken on line 6—6 of Fig. 3.

Referring to the drawing, the counter comprises generally a reset shaft A upon which is rotatably mounted a plurality of counter wheel units B of successively higher order. In Fig. 1, two such units are shown, but it is to be understood that the counter may have any desired number of such units. The unit of lowest order, the right hand one in Fig. 1, may be driven in any suitable manner, the drive pinion C being illustratively shown in broken lines for this purpose. Between the units of successive orders is the usual tens-carrying or transfer means which includes a transfer pinion, such as the pinion shown by broken lines in Figs. 1 and 2 and designated by the letter D. The pinion, as is customary, has eight teeth, the alternate ones of which are shorter than the intervening ones. Each of the units has a numeral wheel 10, a twenty-toothed or driven gear 11, and ratchet pawls 8 pivotally carried by the wheel and cooperating with ratchet teeth 9 formed on the gear 11. The gear teeth are designated by the numeral 11'. Also, each wheel is provided with a spring pressed reset pawl 12, and the reset shaft A has the usual longitudinal groove 13 which picks up the reset pawls of the several units to turn the wheels thereof back to zero during a resetting operation. In order to prevent overthrow of a wheel of higher order at the completion of a resetting operation, each wheel of lower order is provided with a stop or non-overthrow pawl 14 which, as hereinafter explained more in detail, cooperates with the wheel of next higher order.

The counter units are of similar construction, and a description of one will apply to all. The counter wheel 10 of each unit is preferably formed of plastic, as by a molding operation. The numeral wheel has a hub 20 from one end of which radially extends a disk portion or web 21 which terminates in a peripheral rim or cylindrical flange 22. The hub has a through bore 23 which accommodates the reset shaft A, and this bore, at one end is enlarged, as at 24. The right hand end of the hub, as viewed in Figs. 1 and 5, extends laterally beyond the free end of the rim 22 and is of reduced diameter so as to provide a tubular extension 25 which serves as a bearing for the driven or twenty-toothed gear 11. The end of the tubular extension of the hub of one wheel is adapted to engage and have a bearing in the enlarged bore 24 of the wheel of next lower order, as indicated in Fig. 5. The right hand end of the hub, short of the tubular extension 25, is provided at opposite sides with pillars or bosses 26 which have recesses or bores 27 for accommodating the pivots of the ratchet pawls 8. That portion of the hub which is straddled by the bosses 26 is tubular and is slightly spaced from the bosses. Each numeral wheel 10 further has,

preferably formed integrally therewith, an annular locking shoulder or disk 38 adapted to cooperate with the longer teeth of the transfer pinion D in such manner that the pinion, during a registering operation, is held against rotation at all times except during a transfer movement to a wheel of higher order. The numeral 31 designates the usual mutilated or two-toothed driving gear which cooperates with the transfer pinion to rotate the same one step during each transfer movement. Each wheel, on its peripheral flange or rim 22, as, as is usual, numerals consecutively arranged and running from "0" to "9."

The reset pawl 12 of each counter wheel unit is positioned for pivotal movement within a generally triangular-shaped recess 35 in that side of the wheel from which the locking shoulder 38 extends. The nose of the pawl is adapted to extend through a slot leading from this recess to the bore 23 and is normally urged inwardly towards the reset shaft by a generally U-shaped spring 36 also located within the recess 35. It is understood, of course, that when the wheel is driven during a registering operation, the reset pawl will ratchet over the groove 13 in the then non-rotating reset shaft, and when the reset shaft is turned to reset the wheel, the abrupt shoulder of this groove will pick up the pawl and turn the wheel to zero or other starting position while the driven gear 11 of the unit remains stationary.

The non-overthrow pawl 14 of each unit is also located in a recess 37 similar to, but somewhat lesser in depth than, and located diametrically opposite, the recess 35 which accommodates the reset pawl. The non-overthrow pawl is pivoted in one end of the recess 37 and is urged inwardly by a spring 38 similar to the spring 36. The nose of this pawl 14 is adapted to extend into the enlarged bore or bearing 24 and cooperate with a shoulder 39 provided at the trailing end of a notch 40 in the tubular extension 25 of the numeral wheel of next higher order. With this arrangement, during a resetting operation, effected by turning the reset shaft A clockwise with reference to Fig. 2, the groove 13 of the reset shaft will pick up the several reset pawls and turn the wheels to zero, and when a wheel of lower order has been reset to zero, the non-overthrow pawl 14 thereof will act as a stop against which the shoulder 39 of the hub extension of the wheel of next higher order will engage whereby the latter wheel is prevented from being thrown past zero position.

Referring now to the driven gear and the pawl and ratchet arrangement to which the invention of the present application particularly appertains, the driven gear 11 of each counter unit comprises a metal disk member preferably stamped from sheet metal and having at its central portion a cylindrical flange or sleeve 45 which receives and is journaled on the tubular extension 25 of the hub of the numeral wheel. The disk member 11 is stepped, adjacent its margin, towards the wheel, as at 46, so that the perimeter of the disk member is offset from the body portion of the disk. This offset perimeter is provided with gear teeth 11', usually twenty in number, and which gear teeth cooperate with all of the teeth of the transfer pinion. Formed integrally with this gear are inwardly directed ratchet teeth 9 corresponding in number and spacing to the numerals on the perimeter of the wheel. These teeth are preferably generally V-shaped so as to provide generally V-shaped notches therebetween. The ratchet teeth 9, which are in the plane of the gear teeth 11', are preferably formed, during the stamping and forming operation, by cutting slits in the disk adjacent the stepped portion thereof and offsetting the teeth thus formed at the same time that the perimeter of the disk is offset from the plane of the body portion of the disk. It will thus be seen that the member which forms the driven gear and the ratchet wheel is very economically formed from a single sheet of metal and that the member thus formed is light in weight and takes up but a small amount of space. By offsetting the ratchet teeth, as stated, they are brought into the plane of the ratchet pawls 8.

The ratchet pawls have integral, laterally extending pintles 50 journaled in the bores 27 of the respective pillars 26 which, as previously stated, are provided adjacent the right hand end of the hub 20 of the numeral wheel. The operative or driving end of each pawl is of such shape as to engage in the notches between the ratchet teeth in such manner that when the driven gear 11 of a counter unit is rotated counterclockwise (Fig. 3) during a registering operation, the associated pawls serve as driving connections between the gear member and the numeral wheel of that unit. During a resetting operation, the numeral wheel is rotated counterclockwise with respect to Fig. 3, and during such time, the ratchet pawls will ratchet over the ratchet teeth, thus permitting the driven gear 11 to remain stationary. Each of the ratchet pawls is normally urged outwardly into engagement with the ratchet teeth by means of a spring 51. Each of the springs 51 is substantially C-shaped, and the spring of each pawl is so arranged as to retain the spring of the other pawl in position. As shown in the drawing, that portion of the tubular extension of the hub which is straddled by the pillars 26 is provided at diametrically opposite points with slots 52, and the springs 51 have, at their inner ends, inturned lips 53 which respectively engage in these slots. Each spring has a semi-cylindrical portion which follows the contour of the hub throughout slightly more than half of its perimeter and passes between the hub and one of the pillars. The spring extends outwardly and then inwardly. The outer end of the spring has an eye or hook 54 in which is engaged a lug 55 extending laterally from the pawl 8 adjacent the driving end thereof. With the spring so constructed, when the inner ends thereof are anchored to the hub at diametrically opposite points, as explained, each spring, in part, overlies the anchored end of the other one so that the springs are maintained in position without the necessity of any permanent connection. In order to limit the outward movements of the driving ends of the ratchet pawls under the influence of the springs 51 during the operation of assembling the parts, each pawl has a rearwardly extending arm 56 which is adapted to engage the hub 20.

It will be seen from the foregoing description, taken in connection with the accompanying drawing, that a counter unit constructed in accordance with the present invention is composed of relatively simple parts which may be made at a relatively low cost, and these parts may be assembled with considerable facility and ease. Thus, a counter composed of these units may be economically produced, and such counter will prove accurate, effective, and durable in opera-

tion. In assembling a unit, it is merely necessary to insert the reset pawl and the non-overthrow pawl, together with their springs, into the respective recesses provided in one side face of a numeral wheel, position the ratchet pawls with their pivots 50 in the bores provided in the pillars of the hub, then position the reset springs 51 in the manner previously described, and finally slip the combined driven gear and ratchet wheel onto the hub extension 25 to the position shown in Figs. 5 and 6. The several units having been assembled, they may now be successively mounted on the reset shaft with the tubular extension 25 of each wheel of higher order telescoping into the bearing or enlarged bore 24 of the unit of next lower order. The operation of the counter will be understood from the preceding description.

As many changes could be made in the above construction and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all of the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

I claim as my invention:

1. A counter unit comprising a numeral wheel having a central hub, a pair of pillars carried by the hub to opposite sides thereof and terminating short of one end of the hub, ratchet pawls pivoted in said pillars, and a disk constituting a driven gear and a ratchet wheel journaled on said end of said hub adjacent said ratchet pawls, the rim of said disk being offset to lie in the plane of said ratchet pawls and being provided on its inner edge with ratchet teeth engageable with said pawls and on its outer edge with gear teeth adapted to mesh with a driving member.

2. A counter unit comprising a numeral wheel having a central hub, a pair of pillars carried by the hub to opposite sides thereof and terminating short of one end of said hub, ratchet pawls pivoted in said pillars on axes parallel to the axis of said hub, a member comprising a one-piece metal stamping having a collar rotatably mounted on said end of said hub and a disk portion carried by said collar, the rim of said disk portion being offset to lie in the plane of said ratchet pawls and being provided on its inner edge with ratchet teeth engageable with the pawls and on its outer edge with gear teeth adapted to mesh with a pinion, and springs for urging said pawls into engagement with said ratchet teeth.

3. A counter unit comprising a numeral wheel having a central hub provided at one end with a reduced tubular extension, said end of said hub having, to opposite sides of the axis of the hub, bores terminating short of said tubular extension, ratchet pawls having pintles journaled in said bores, a member comprising a one-piece metal stamping having a collar rotatably mounted on said hub and a disk portion carried by said collar and between which and the end of said hub said ratchet pawls are positioned, the disk portion of said member being stepped adjacent its periphery to provide an offset rim provided on its perimeter with gear teeth, said disk portion further having formed integrally therewith and offset therefrom into the plane of said rim inwardly directly V-shaped ratchet teeth with which the operative ends of said pawls are adapted to engage, and spring means for urging said ratchet pawls into engagement with said ratchet teeth.

4. In a counter unit, a combined driven gear and ratchet member comprising a one-piece sheet-metal disk having a central collar and a disk carried thereby, the rim of the disk being offset out of and being parallel to the plane of the body portion of the disk, spaced apart offset connecting portions between the body portion of the disk and the rim and notches between the connecting portions, and ratchet teeth offset out of said notches, said ratchet teeth being in the plane of and extending inwardly from said rim.

5. A counter unit comprising a numeral wheel having a central hub provided with a bore for mounting the wheel on a shaft, a pair of ratchet pawls pivotally mounted to opposite sides of the axis of said hub, and a spring associated with each pawl and normally biasing the same in an outward direction, each of said springs being anchored at one end to a respective pawl and having its other end removably anchored to the hub of the wheel, the anchored ends of said springs being diametrically opposite each other and each spring having a contour following the hub contour through substantially half the circumference thereof to cause each spring to overlap the anchored end of the other spring to thereby maintain the other spring in position.

6. A counter unit comprising a numeral wheel having a hub provided with a generally tubular portion adjacent one end thereof, a pair of pivoted ratchet pawls, bearings to opposite sides of the tubular portion of said hub for pivotally supporting said pawls, said tubular portion having diametrically disposed notches, and a spring associated with each pawl comprising a generally C-shaped member having at its inner end a generally semi-cylindrical portion embracing the tubular portion of the hub and having its outer end connected to a pawl, the extreme inner ends of said springs having lips engaging in said respective notches, and the cylindrical portion of one spring being in overlapping relation to the anchored end of the other spring whereby said springs are maintained in position on the hub.

7. A counter unit comprising a numeral wheel having a hub provided adjacent one end thereof with a generally tubular portion and a pair of pillars to opposite sides of said tubular portion and slightly spaced therefrom, said tubular portion having oppositely disposed notches in its periphery, a pair of ratchet pawls pivotally mounted in said pillars, and a generally C-shaped spring associated with each pawl for normally urging the same in an outwardly direction, each of said springs having a lip engaging in a respective notch and a semi-cylindrical portion embracing said tubular extension and in overlapping relation to the anchored end of the other spring and located between said tubular extension and a respective pillar.

8. A counter unit comprising a numeral wheel having a central hub provided with a bore for mounting the wheel on a shaft, a pair of ratchet pawls pivotally mounted to opposite sides of the axis of said hub, and a spring associated with each pawl and normally biasing the same in an outward direction, each of said pawls having a rearwardly extending stop arm adapted to engage

said hub for limiting the outward movement of the pawls.

9. A counter unit comprising a numeral wheel having a central hub provided with a bore for mounting the wheel on a shaft, a pair of ratchet pawls pivotally mounted to opposite sides of the axis of said hub, and a spring associated with each pawl and normally biasing the same in an outward direction, each of said springs being anchored at one end to a respective pawl and having its other end removably anchored to the hub of the wheel, the anchored ends of said springs being diametrically opposite each other and each spring having a contour following the hub contour through substantially half the circumference thereof to cause each spring to overlap the anchored end of the other spring to thereby maintain the other spring in position, each of said pawls having a rearwardly extending stop arm adapted to engage said hub for limiting the outward movement of the pawls.

10. A counter unit comprising a numeral wheel having a hub provided at one end thereof with a generally tubular portion, a reduced tubular extension and a pair of pillars to opposite sides of said tubular portion and slightly spaced therefrom, said tubular portion having oppositely disposed notches in its periphery, a combined driven gear and ratchet wheel journaled on said tubular extension, a pair of ratchet pawls pivotally mounted in said pillars and engageable with said ratchet wheel, and a generally C-shaped spring associated with each pawl for normally urging the same into engagement with said ratchet wheel, each of said springs having a lip engaging in a respective notch and a semi-cylindrical portion embracing said tubular extension and in overlapping relation to the anchored end of the other spring and located between said tubular extension and a respective pillar.

HAROLD B. VROOM.