Jan. 23, 1951 M. E. TOBY 2,538,988

PREDETERMINING COUNTER

Filed Feb. 18, 1946 4 Sheets-Sheet 1

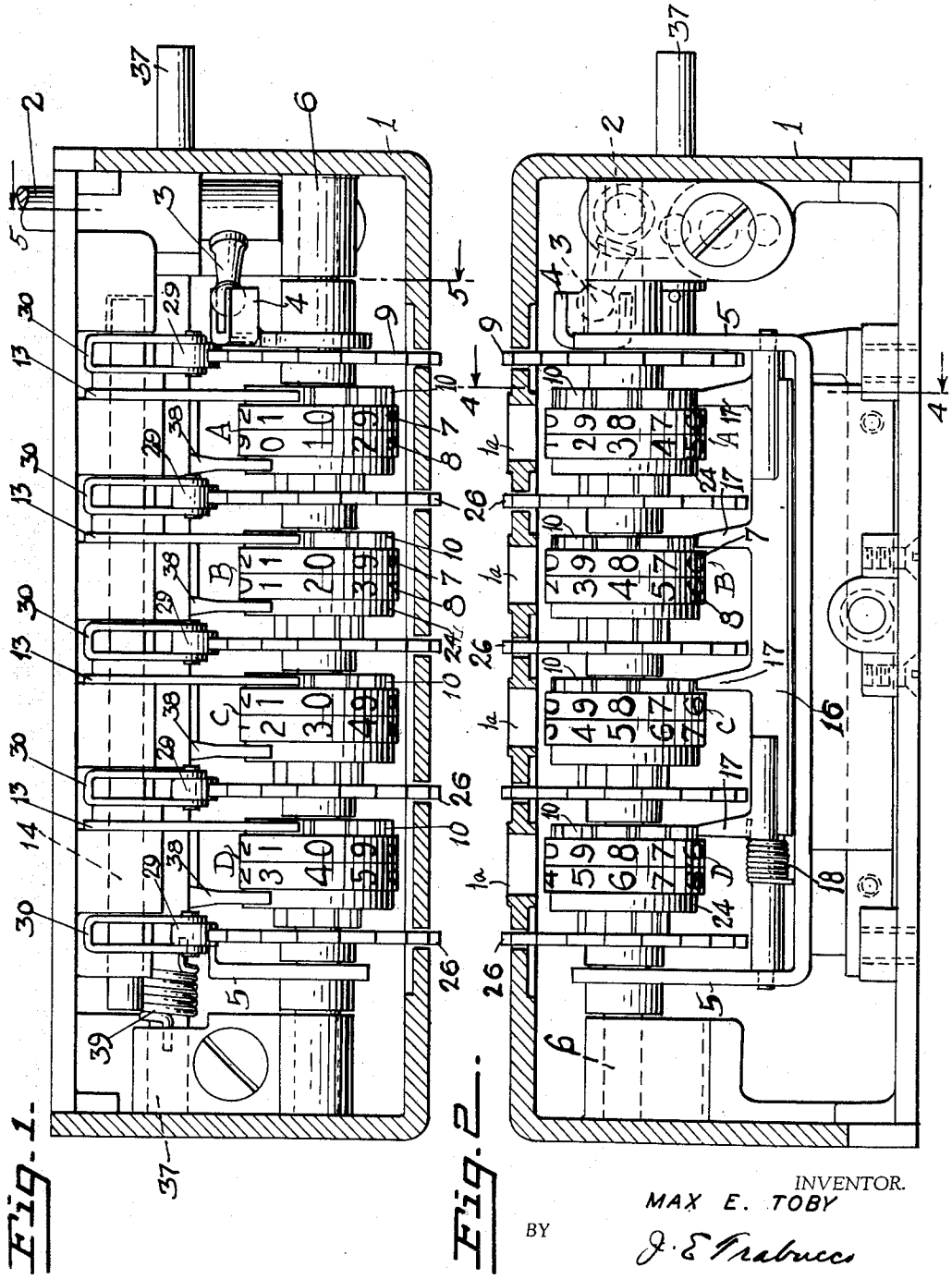

Fig. 1.

Fig. 2.

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Fig. 3.

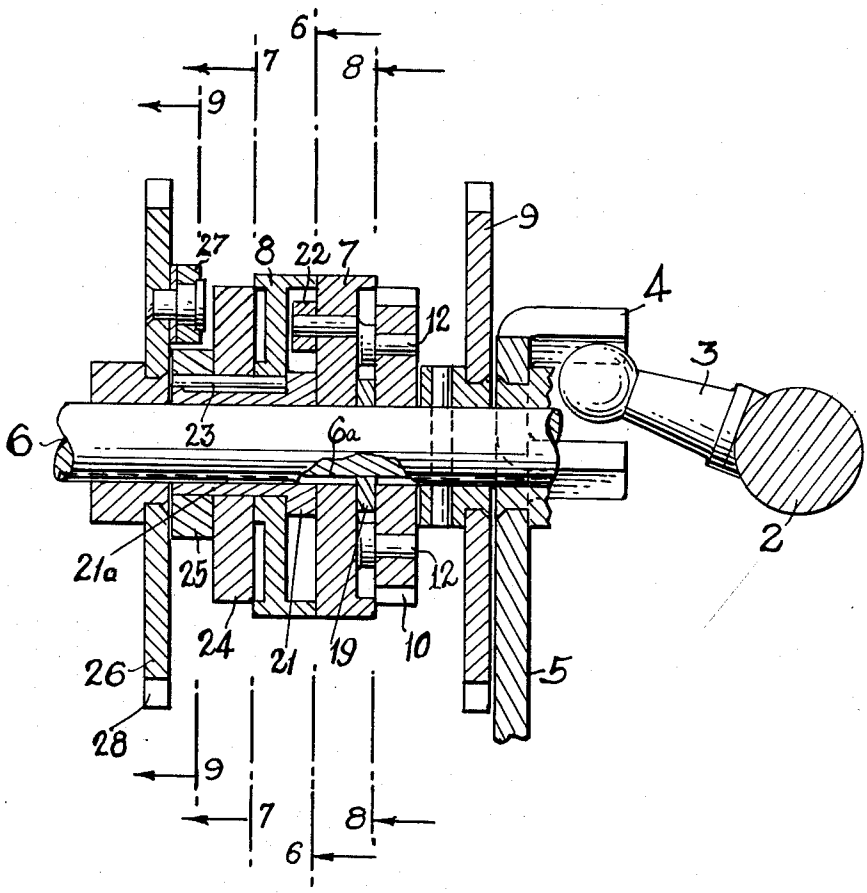

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Fig. 4.

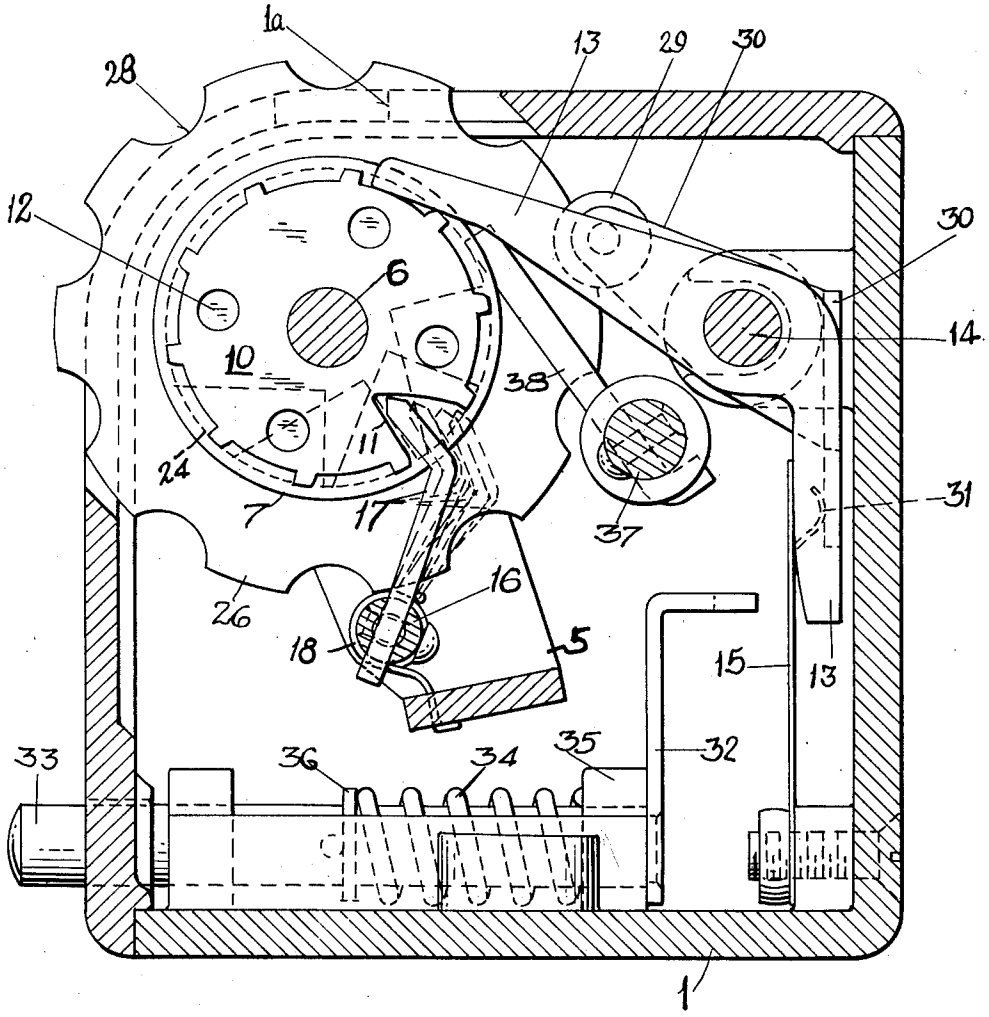

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Fig. 5.

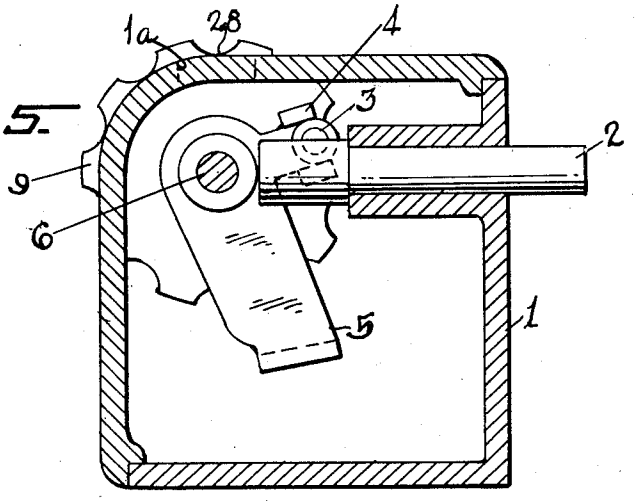


Fig. 6

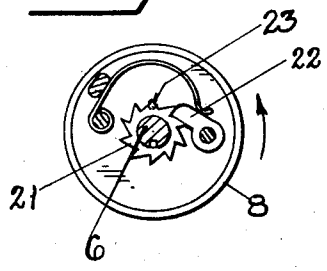


Fig. 7.

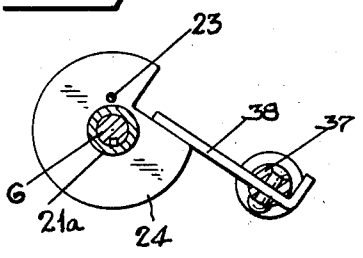


Fig. 8.

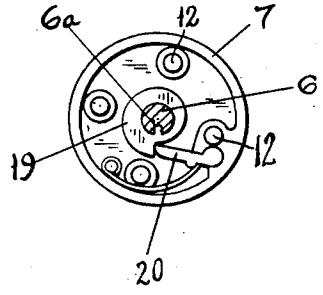
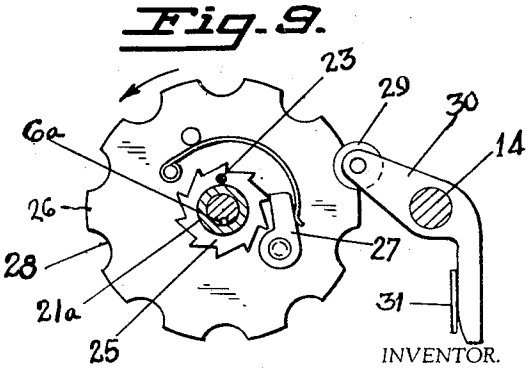


Fig. 9.



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Patented Jan. 23, 1951

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UNITED STATES PATENT OFFICE

2,538,988

PREDETERMINING COUNTER

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Application February 18, 1946, Serial No. 648,471

5 Claims. (Cl. 235—132)

1

This invention relates to improvements in counters.

An object of my invention is to provide an improved counter of the predetermined counter type adapted to count a predetermined number of successive operations.

Another object of my invention is to provide an improved counter of the kind characterized, having adjustable predetermining means adapted to be set to count up to a selected number, and then operatively control an associated device.

A further object of my invention is to provide an improved predetermined counter having means adapted to be set to count a predetermined number of successive operations, and embodying also an arrangement whereby the number of operations already performed will be indicated at all times.

A still further object of my invention is to provide an improved counting mechanism which is characterized by its accuracy in counting and the ease and facility with which the predetermining counter may be reset.

Other and further objects of my invention will be pointed out hereinafter or will be indicated in the appended claims, or will be obvious to one skilled in the art upon an understanding of the present disclosure. For the purpose of this application, I have shown certain details of a counter representative of my invention; it is to be understood, however, that the embodiment of my invention herein shown and described is for the purpose of illustration only, and that therefore it is not to be regarded as exhaustive of the variations of the invention, nor is it to be given an interpretation such as might have the effect of limiting the claims, short of the true and most comprehensive scope of the invention in the art.

In the drawings:

Fig. 1 is a top plan view of a counter embodying my invention;

Fig. 2 is a front elevation of the same;

Fig. 3 is an enlarged sectional view taken through one of the counting units;

Fig. 4 is an enlarged sectional view taken on the line 4—4 of Fig. 2;

Fig. 5 is a sectional view taken on the line 5—5 of Fig. 1;

Figs. 6, 7, 8 and 9 are sectional views taken on the lines 6—6, 7—7, 8—8, and 9—9, respectively, of Fig. 3.

Referring to the drawings the numeral 1 designates a supporting frame or casing for the counting mechanism.

An operating shaft 2, connected in the usual

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manner to a mechanism of which the operations are to be counted, is formed with an inwardly protruding element 3 which is arranged in operative engagement with a U-shaped member 4 carried by an operating yoke 5. The oscillatory movement of the shaft 2 will cause the pivotal reciprocatory movement of the operating yoke forwardly and rearwardly.

The operating yoke is pivotally suspended from a rotatable shaft 6 having a longitudinal key way or slot 6a formed therein. The shaft 6 provides an axial support for a number of independently rotatable counting wheels 7 and predetermined count wheels 8 each of which carries a series of equally spaced consecutive numbers from 0 to 9 at its periphery.

The counter, for illustration purposes, is shown as having four denominational groups or units A, B, C, and D, each of which comprises similar elements which are arranged for observation through sight openings 1a provided in the upper side of the casing or frame. Affixed to the shaft 6 is a master resetting disc 9 which is capable of being hand rotated only in a forward or counter clockwise direction as viewed from its position shown in Fig. 5. The master resetting disc by rotating the shaft 6, effects the rotation of the counting wheels 7 and the predetermined count wheels 8 of all of the denominational units as will be described later.

Arranged alongside the counting wheel 7 of each of the units is a ratchet wheel 10 which is mounted for independent rotation on the shaft 6. The ratchet wheels are formed with ten spaced teeth and the space between two of the teeth are deeply recessed as shown at 11 in Fig. 4. Each of the ratchet wheels 10 is secured to its associated counting wheel 7, as by pins 12. The ratchet wheels are each normally releasably retained in its respectively adjusted position after each partial revolution, by a detent 13. The detents are pivotally mounted on a shaft 14, and a suitable spring member 15 releasably maintains each of them in engagement with its associated ratchet wheel and against one of the latter's teeth, thereby preventing the reverse rotation of the said ratchet wheel after each partial rotation thereof.

Pivotally carried on and between the parallel arms of the yoke 5 is a pawl shaft 16, which for convenience in assembly, is made up of a plurality of joined sections. The pawl shaft 16 carries a series of pawls 17, each of which engages with a ratchet wheel 10. The pawls 17 are so arranged with respect to one another and

to the ratchet wheels 10 that when the particular pawl associated with the ratchet wheel of the denominational unit A engages with the periphery thereof, the other pawls, as shown in Fig. 4, are in disengagement with the peripheral teeth of their respective ratchet wheels. In the same manner, when the particular pawl 17 associated with the ratchet wheel 10 of unit B engages with the said wheel, the pawls associated with the ratchet wheels of units C and D are in disengagement with their respective ratchet wheels; and similarly, the same relationship is present between the pawls and the respective ratchet wheels of units C and D. The only time when the pawl 17 associated with the ratchet wheel 10 of unit B may come in contact therewith is when the pawl of unit A enters the recess 11 of its associated ratchet wheel. In the same manner, the pawl 17 of the units C is permitted to contact its associated ratchet wheel only when the pawls of units A and B occupy the recesses of the ratchet wheels of these units. Similarly, the pawl 17 of unit D is permitted to contact its associated ratchet wheel 17 and enter the recess therein only when the pawls of the other units have occupied the recesses 11 of their associated ratchet wheels.

A spring 18 encircling the pawl shaft 16 urges the latter in a direction whereby its pawls 17 may engage with their associated ratchet wheels 10.

So as to permit the manual resetting of the wheels 7 and 8 when the master resetting disc 9 is rotated forwardly, suitable clutch means is interposed between the rotatable shaft 6 and the counting wheels 7 for operatively connecting them when the resetting disc is manually turned, the said clutch being capable of allowing the independent rotation of the counting wheels during the normal counting operation of the device. Each denominational unit comprises a similar structure wherein a cam 19 housed within the counting wheel 7 is keyed to the shaft 6 and arranged to engage with a spring pressed pawl 20 carried by the counting wheel. When the cam is turned in a counterclockwise direction (Fig. 8) by rotating the shaft 6 through the manipulation of the master resetting disc 9, it engages with the pawl 20 and thereby establishes a connection between the shaft 6 and the counting wheel 7. The continued rotation of the resetting disc 9 will thereupon cause all of the counting wheels 7 to be turned to the desired reset position, and with the predetermined count wheels 8 connected to the counting wheels 7 in the manner hereinafter described, these also will be rotated and reset along with the counting wheels when the master resetting disc 9 is adjusted in a forward or counterclockwise direction. Since the arrangement of the cam 19 and pawl 20 is such that the pawl can be carried by the wheel 7 in counterclockwise direction around the cam without operatively engaging therewith, the said wheel is thereby free to be rotated by the operating mechanism in the manner heretofore described.

The relative arrangement of the peripheral markings or numbers on the counting wheels 7 with respect to the recesses 11 of the ratchet wheels is such that when the zero marks are in alignment the recesses are also in alignment.

Referring particularly to the denominational counting units A, B, C and D, it is to be noted that each have identical constructions wherein a counting wheel 7 and a predetermined count wheel 8 are arranged in operative association adjacent one another, and accordingly a description of one will suffice for all. The peripheral numbers carried by the predetermined count wheels 8 are in reverse order with respect to the corresponding numbers on the counting wheels, thus when the wheels are simultaneously rotated in the same direction during a counting operation, there will be indicated by the counting wheels a forward count and by the predetermined count wheels a backward count.

Housed within the peripheral edges of the predetermined count wheel 8 is a ratchet wheel 21 having ten equally spaced teeth and a tubular axial extension through which the shaft 6 extends and which forms a bushing 21*a* on which other elements of the assembly are rotatably mounted. Carried by the counting wheel 7 is a spring pressed pawl 22 which engages with the ratchet wheel 21 secured to the predetermined count wheel 8. The predetermined count wheel 8 is free to rotate independently of the counting wheel 7 in a forward or counterclockwise direction (Fig. 6) when it is being reset, but when the wheel 7 rotates in this same direction during a counting operation or when it is being manually reset, the pawl 22 engages with the ratchet wheel 21 and causes the simultaneous rotation of the two wheels.

Secured together as by a pin 23, and rotatably mounted on the bushing 21*a*, is the predetermined count wheel 8, a cam disc 24 and an axially arranged ratchet wheel 25 which has ten equally spaced teeth. Rotatably mounted on the shaft 6 is a manually operable resetting disc 26 for setting the predetermined count wheel 8. The manually operated resetting disc 26 carries a spring pressed pivoted pawl 27 which engages with the axial ratchet wheel 25 secured to the cam disc 24 and the predetermined count wheel 8. When the resetting disc 26 is manually rotated in a forward or counterclockwise direction (Fig. 9) it will carry its connected pawl 27 in the same direction into lock engagement with the ratchet wheel 25, and with the rotation of the latter the cam disc 24 and the predetermined count wheel 8 are both similarly rotated. Thus the predetermined count wheels 8 together with their respectively associated cam discs 24 are each capable of being independently reset. The predetermined count wheels 8 are capable of rotating forwardly or in a counterclockwise direction during the counting operation of the device, independently of the resetting disc 26.

It is to be noted that the pawls 22 carried by the counting wheel 7 are arranged in the same relative positions with respect to a certain number on the peripheries of the said counting wheels, and since the cams 19 are also arranged in corresponding positions, a continued turning of the master resetting disc 9 will bring corresponding numbers on the four counting wheels into horizontal alignment. It is also to be noted that the cam wheels 24 are so correspondingly arranged with respect to a certain common number on the predetermined count wheels 8 that the notches in the said cam wheels will be in horizontal alignment when the predetermined count wheels are positioned with their corresponding numbers aligned.

So as to avoid the possible partial turning of the resetting discs 9 and 26 or either of them in a reverse or clockwise direction and also to provide suitable finger engaging means, each disc is formed at its periphery with ten equally spaced grooves 28, any one of which is adapted to be en-

gaged by a rotatable wheel **29** carried at an end of a pivoted stop member **30**. Each of the stop members **30** is centrally pivoted on the shaft **14**, and an individual spring member **31** (Figs. 4 and 9) engaging with its depending portion urges its upper end forwardly so the wheel **29** carried thereby firmly engages with its associated resetting disc.

So as to provide suitable means for preventing any possible forward or counterclockwise movement of the counting wheels **7** when the predetermined count wheels **8** are being reset, a rearwardly shiftable locking plate **32** is arranged to exert a rearward pressure upon depending ends of the detents **13** through the springs **15**, thereby causing the forward ends of the detents to firmly engage with the ratchet wheels **10** and prevent a clockwise movement thereof. The locking plate **32** is provided with a forwardly extending rod **33**, the forward end of which is positioned for convenient engagement by an operator's finger. A coiled spring **34** encircling the rod **33** and positioned with its opposite ends in engagement with a stationary member **35** and a flange or protuberance **36** on the rod, causes the return of the rod and the locking plate **32** to their forward normal positions when manual pressure on the rod is released.

Extending horizontally in parallel relation to the shaft **14** is a control shaft **37** which, in a well known manner, operates a signal or otherwise governs the operation of a machine to be controlled. Secured to the control shaft **37** are four forwardly and upwardly projecting members **38** which horizontally, are in alignment. The forward ends of the members **38** are positioned in engagement with the peripheries of the cam wheels **24**, and all of them are adapted to move downwardly inside the notches of the cam wheels when the said notches are all in alignment. A spiral spring **39** encircling the control shaft **37** is anchored at its opposite ends to the frame **1** and to the said shaft. The spiral spring exerts a pressure on the control shaft tending to depress the forward ends of the projecting members **38**, and when the notches of the cam wheels **24** are in certain alignment, the said projecting members are free to move downwardly inside the said notches, thereby allowing the spiral spring **39** to partially rotate the shaft to sound a signal or otherwise control the operation of the machine or apparatus to be controlled. The zero markings on the predetermined count wheels **8** are so correspondingly arranged with respect to the notches of the cam wheels **24** that the said zero markings of all of the predetermined count wheels will be horizontally aligned and positioned directly beneath the sight openings **1***a* of the frame or casing when the projecting members **38** of the control shaft have become positioned in the aligned notches.

In the illustrative structure shown and described herein the denominational counting units A, B, C and D, previously set in a relationship designating a predetermined number, will be operated through the continued oscillation of the operating shaft **2** until the predetermined number of operations have been counted, and then the control shaft **37** will be automatically actuated to give a signal or discontinue the operation of an associated machine.

The initial operation of the device requires that the master resetting disc **9** to be first rotated in a forward or counterclockwise direction until all of the counting wheels **7** are in positions where

the zeros are in horizontal alignment directly beneath the sight openings **1***a*. Then with the left hand engaging with and forcing the rod **33** rearwardly to move the plate **32** into locking engagement with respect to the stop members **13**, the predetermined count wheels **8** are rotated through the resetting discs **26** to positions where they indicate the particular number to be counted. The counter is now ready for operation, and with the continued oscillating of the operating shaft **2** the predetermined count wheels **8** and the counting wheels **7** will rotate simultaneously until the predetermined number of operations have been completed, at which time the control shaft **37** will be actuated to control the operation of the associated machine. When the predetermined number of operations have been performed the counting wheels will indicate the counted number and the predetermined count wheels will indicate zero. The same number of operations may be repeated by manipulating the master resetting disc **9** until the counting wheels **7** indicate zero, at which position the predetermined count wheels **8** will indicate the previously selected number.

What I claim is:

1. A predetermining counter, a plurality of axially aligned operatively connected counting mechanisms, each of said mechanisms having a counting wheel, a predetermining wheel and ratchet means releasably connecting each counting wheel and its associated predetermining wheel and operable to effect an operative connection between said wheels only when the counting wheel is rotated in its positive counting direction, the said ratchet means being releasable upon the manual rotative independent adjustment of the predetermining wheel in the same direction the counting wheels rotate when effecting a positive count, means for rotatively adjusting the counting wheels simultaneously to bring them into preset positions preparatory to a counting operation, a rotatable adjusting disc associated with each predetermining wheel and rotatable only in the direction the counting wheels rotate when effecting a positive count, a second ratchet means releasably connecting each predetermining wheel and its associated adjusting disc and operable to effect an operative connection therebetween only upon the rotative movement of the disc in the same direction the counting wheels are rotated in their positive counting direction, the said second ratchet means being releasable when the predetermining wheel is rotated with the counting wheel during a counting operation, a notched cam wheel secured to each predetermining wheel, and control means cooperating with the notched cam wheels and operable when the notched cam wheels assume predetermined corresponding positions.

2. In a predetermining counter, a plurality of axially aligned operatively connected counting mechanisms, each of said mechanisms having a counting wheel, a predetermining wheel and ratchet means releasably connecting each counting wheel and its associated predetermining wheel and operable to effect an operative connection between the said wheels only when the counting wheel is rotated in its positive counting direction, the said ratchet means being releasable upon the manual rotative independent adjustment of the predetermining wheel in the same direction the counting wheels rotate when effecting a positive count, means for rotatively adjusting the counting wheels simultaneously to bring

them into preset positions preparatory to a counting operation, a rotatable adjusting disc associated with each predetermining wheel and rotatable only in the direction the counting wheels rotate when effecting a positive count, means for holding each adjusting disc in a stationary position during the rotation of its associated predetermining wheel during a counting operation, a second ratchet means releasably connecting each predetermining wheel with its associated adjusting disc and operable to effect an operative connection therebetween only upon the rotative movement of the adjusting disc, the said second ratchet means being releasable when the predetermining wheel is rotated with the counting wheel during a counting operation, a cam wheel operatively connected to and rotatable with each predetermining wheel and arranged in a certain position with respect to a zero marking on its associated predetermining wheel, the said cam wheels and predetermining wheels of the counting mechanisms being in corresponding relative positions, and control means cooperating with the cam wheels and operable when the cam wheels assume predetermined corresponding positions.

3. In a predetermining counter, a rotatable supporting shaft; a plurality of axially aligned operatively connected counting mechanisms mounted on the shaft, each of said mechanisms having a counting wheel, a predetermining wheel and means releasably connecting the shaft and a counting wheel and operable to effect an operative connection therebetween upon the rotative movement of the shaft in the direction the counting wheels rotate when making a positive count, means for rotating the shaft to effect the simultaneous adjustment of the counting wheels to bring them into preset positions, ratchet means releasably connecting each counting wheel and its associated predetermining wheel and operable to effect an operative connection between the said wheels only when the counting wheel is rotated in the direction it rotates when making a positive count, the said ratchet means being releasable only upon the independent manual rotative adjustment of its associated predetermining wheel in the same direction the counting wheels rotate when making a positive count, an independent hand rotatable adjusting disc operatively connected to each predetermining wheel for adjusting said wheel to indicate the number of operations to be counted, and control means associated with the predetermining wheels in any adjusted position thereof and operable only when the said predetermining wheels have been rotated in accordance with the predetermined number of operations to be counted.

4. In a predetermining counter, a plurality of axially aligned operatively connected counting mechanisms, each of said mechanisms having a counting wheel, a predetermining wheel and ratchet means releasably connecting each counting wheel and its associated predetermining wheel and operable to effect an operable connection between both of said wheels only when the counting wheel is rotated in its positive counting direction, means for rotatively adjusting the counting wheels simultaneously to bring them into a preset position preparatory to a counting operation, a rotatable adjusting disc operatively connected through ratchet means with each predetermining wheel and rotatable only in the direction the counting wheels rotate when effecting a positive count, the said adjusting discs each having a predetermined number of uniformally spaced grooves arranged circularly in its periphery, and spring pressed means engageable with the periphery of each adjusting disc and adapted to become lodged in one of the peripheral grooves of the said disc, whereby the said disc is releasably held against rotation with its associated predetermining wheel during a counting operation.

5. In a predetermining counter, the combination set forth in claim 4 together with hand operated means for holding all of the counting wheels against rotation when the predetermining wheels are being reset.

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