Jan. 27, 1959 S. V. KLEIN 2,870,962

COUNTING DEVICE

Filed May 31, 1955

FIG. 1

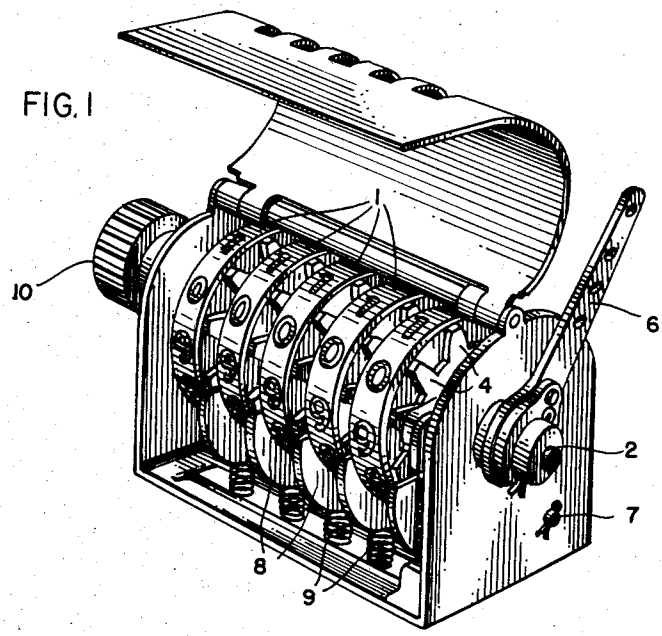


FIG. 3

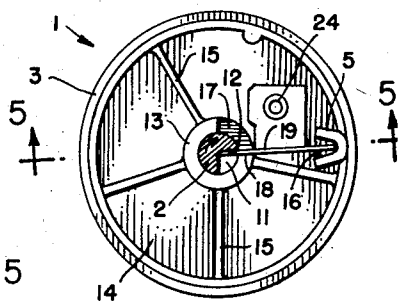


FIG. 2

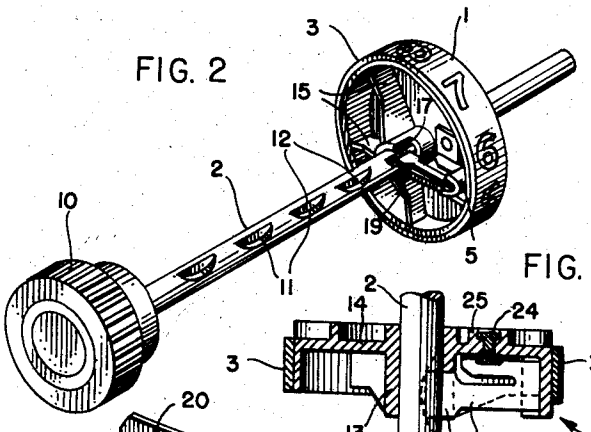


FIG. 5

FIG. 4

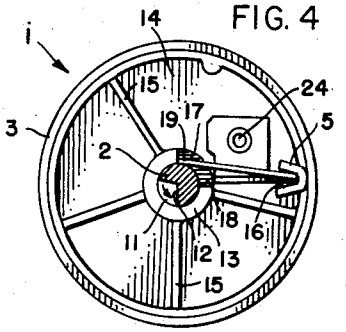


FIG. 7

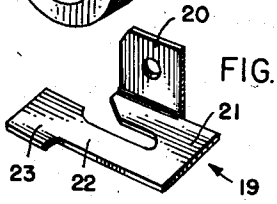


FIG. 6

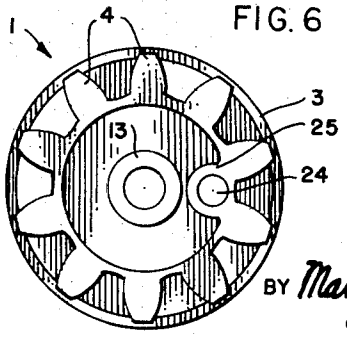
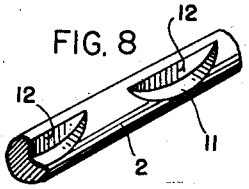


FIG. 8



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COUNTING DEVICE

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This invention relates to mechanical counting devices, and more particularly to indicating wheels or cylinders which may be mounted to rotate in adjacent positions upon a single shaft and may be coupled together to provide a counting operation and to provide a visual indication thereof.

Each individual counting wheel or cylinder of a decimal counting device may have ten radial teeth equally spaced in a plane about the shaft and may have a single tooth placed in a second plane. Each counting wheel is driven from a gear or ratchet engaging successively the ten teeth spaced on a driven side of the wheel. The single tooth will engage a second gear once each revolution and give it an increment of motion, which motion is transmitted to a second counting wheel, thereby causing the second wheel to rotate an increment of one-tenth of a revolution. The counting device may include any number of counting wheels or cylinders, all coadjacently spaced on the single shaft and each turning an increment of one-tenth of a revolution for every revolution of the wheel immediately to the right of it. The wheel on the extreme right may receive its incremental motion from a ratchet device which may be mechanically operated by oscillations provided to a rocker arm.

If the actuation oscillations are received from an operating machine, the operations of which are to be counted, such oscillations may be rapid or jerky in character. The quick motion of the ratchet upon the first cylinder may impart considerable angular momentum thereto. Such an angular momentum may cause the wheel to overshoot and turn two or more increments of rotation rather than the desired single increment. Obviously such overshooting, due to the rapid or jerky oscillations, may cause skipping or jumping and result in inaccurate counting.

The shaft upon which the indicating wheels are mounted may provide a reset means for removing the numerical indication and for turning each individual indicating wheel back to a zero position. To accomplish this, the shaft is provided with a convenient knurled knob and with one or more notches to provide stops engageable by a pawl on each of the indicating wheels. To reset the indication of the counting device back to zero, the shaft is manually turned by means of the knob and the pawls on each indicating wheel engage the notches on the shaft to rotate each individual wheel back to a zero position.

An object of this invention is to provide an improved counter wheel which has less weight than those presently used and which will, therefore, acquire less angular momentum when impelled by rapid motion mechanically transmitted thereto, and, therefore, has less tendency to overshoot and turn more than a single increment of movement.

A further object of this invention is to provide an improved counter wheel which may be of a plastic material, such as nylon, and which may be molded in a single operation, thereby affording an economy in manufacture.

Another object is to provide an improved pawl arrangement for permitting the wheel to rotate in but a single direction relative to the reset shaft, the pawl comprising a single leaf spring having a part for engagement with the shaft, a part for attachment to the body of the wheel and a U-shaped part which may be fitted into a grooved part of the wheel, giving the structure added stability and resiliency.

A further object is to provide an improved design for a counter wheel having ten equally spaced teeth on one side of a disc-like web structure and having a single tooth on the other side thereof, the single tooth being formed with internal surfaces creating a slot or groove for receiving the spring pawl, the wheel containing a hub portion with a segment thereof removed or open, the open segment providing a shoulder against which the spring pawl may bear when engaged with the shaft in a locked position.

A more complete understanding of the present invention, its mode of operation and its advantages may be gathered from further reading of this specification together with an inspection of the accompanying drawing, in which:

Fig. 1 is a perspective view of a counting machine having the indicating wheels as taught by this invention, the cover or housing of the counting machine being shown in a raised position to expose the structure of the indicating wheels therein;

Fig. 2 is a perspective view of an indicating wheel mounted upon the reset shaft;

Fig. 3 is an elevational view of a side of the counting wheel showing a single tooth, and the manner of mounting the spring pawl;

Fig. 4 is an elevational view similar to Fig. 3 but showing the function of the spring pawl as it releases the wheel from the shaft for opposite rotation thereof;

Fig. 5 is a detail sectional view on the line 5—5 of Fig. 3;

Fig. 6 is an elevational view of the side of the counting wheel opposite to that shown in Fig. 3;

Fig. 7 is an enlarged perspective view of the leaf spring pawl; and

Fig. 8 is an enlarged fragmentary perspective view of a portion of the reset shaft.

The counting machine comprises generally a plurality of indicating wheels or cylinders **1** mounted to rotate independently in adjacent positions upon a reset shaft **2**. Each indicating wheel has a cylindrical peripheral rim **3** bearing the indicia or numerals one to nine and zero, in sequence, the numerals being positioned about the wheel in equal increments of arc. On one side of each wheel are ten equally spaced teeth **4** adapted for driving engagement by a tooth gear or by a ratchet member (not shown). On the opposite side of each wheel a single tooth **5** is positioned in spaced relation opposite one of the ten driving teeth and is adapted to engage another gear which drives the next succeeding indicating wheel. A ratchet mechanism (not shown) translates oscillatory motion of a rock arm **6** into incremental rotation of the right-hand indicating cylinder **1**, Fig. 1. Thus, for each oscillation of the rock arm **6** the right-hand cylinder **1** will rotate an increment of one-tenth of its complete arc, and the next succeeding numeral will appear in viewing position thereon. When any particular cylinder makes one complete revolution, the single tooth **5** engages a gear (not shown) mounted to rotate upon a shaft **7** and to impart an increment of rotation thereto. This increment of rotation is translated to another indicating wheel situated adjacent to and on the left-hand side of the first wheel. Thus, for each complete rotation of any particular indicating wheel, the next succeeding wheel is rotated through an incremental arc sufficient to turn the next succeeding numeral into a viewing position thereon.

Each of the indicating wheels 1 is urged into a stable predetermined position by a member 8 which is urged against the teeth 4 by a spring 9. Thus, each indicating wheel moves from one stable position to a second stable position by each increment of motion and comes to rest such that the reference numeral appearing in the viewing position is properly centered.

The counting machine is provided with a means for resetting the indicating wheels such that each is positioned with the zero numeral appearing in the viewing position as is shown in Fig. 1. The resetting is accomplished by turning the reset shaft counterclockwise to an extreme position by means of a knurled knob 10 and then returning it in a clockwise direction until the zero settings appear in the viewing position. The reset shaft 2 is provided with aligned longitudinal notches 11, each providing an abutting shoulder 12 (see Fig. 8) for engagement with a pawl affixed on each indicating wheel. By means of the pawl, each counter wheel may rotate freely on the reset shaft in the normal direction for the counting function; but each wheel locks to the shaft when the shaft is turned clockwise for the resetting function. Since each counter wheel is identical to the others in its manufacture, the angular positioning of the pawl relative to the numerals on the rim 3 is likewise identical; and the corresponding numerals of all of the wheels will be turned into alignment when all of the respective pawls engage the shoulders 12 of the notches 11 which are in alignment on the reset shaft. Thus, by turning of the reset shaft, all of the zeros will appear simultaneously in the viewing position of the counting machine.

The indicating wheels of this invention may be formed from a thermoplastic material, such as nylon, which may be easily molded and which is light in weight. The wheel comprises generally a cylindrical rim 3 about its periphery, a hub 13, and a body or disc-like portion 14. The peripheral rim bears the indicia or numerals and may either be integrally molded to the wheel or provided with an auxiliary piece which may be decorative. Radial webs 15 may provide thickened portions between the rim and the hub to reinforce the body or disc portion 14 and to strengthen the wheel generally. A plurality of teeth 4, generally ten in number, are positioned adjacent to the disc portion 14 and are molded integral therewith. Thus, the teeth 4 are actually formed as thickened portions of the disc body 14. The single tooth 5 positioned on the opposite side of the wheel is also integrally formed and molded with the other parts of the wheel. This tooth is formed with internal surfaces such that a groove or slot 16 opens inwardly towards the hub to receive and to provide clearance for a resilient part of the leaf spring pawl.

The hub 13 has an open segment 17 which may be molded directly or which may be formed subsequent to molding by the removal of a portion of the hub. The segment thus removed from the hub provides a shoulder stop 18 (see Figs. 3 and 4) which is aligned with the groove 16 in the single tooth 5 and against which the spring pawl may bear when engaged with the reset shaft 2.

As is shown in Fig. 7, a pawl 19 may be formed from a single leaf of spring steel with one part 20 thereof turned at right angles and adapted for attachment with the body or disc part 14 of the wheel 1. A U-shaped part 21 forms two legs, one of which joins a perpendicular attachment part 20 and the other leg 22 being essentially straight and terminating in a broadened part 23 which is adapted to be interposed between the stop shoulder 18 of the hub on the wheel and the shoulder part 12 of the notched shaft 2.

The resiliency of the straight leg 22 of the pawl 19 permitting engagement and disengagement of the notched shaft 2 is obtained through the novel shape of the pawl and the manner of attachment thereof. The attachment lug 20 is conveniently located within the confines of the

counter wheel; and the U-shaped part 21 placed within a groove near the periphery of the wheel provides a maximum length for the resilient leg 22 without having parts extending beyond the wheel rim 3. The design of the wheel is simplified by the utilization of single tooth 5 to provide the structure containing the groove 16. Although any one of the ten teeth 4 as well as the single tooth 5 can contain the internal surfaces of the groove 16, such an arrangement will not necessitate that a further structure be added to the wheel. Therefore, the use of a single wheel part to serve the dual functions of a tooth for engaging a transfer gear and of a groove for receiving the pawl 19 constitutes a simplification affording economy in manufacture.

The leaf spring pawl 19 may be attached to the indicating wheel 1 by any of several means. As illustrated in Figs. 3, 4, 5 and 6, a rivet 24 extends through the attachment lug 20 and through a thickened or bossed portion 25 of the body of the indicating wheel.

A better understanding of the function of the leaf spring pawl 19 may be gathered by referring to Figs. 3 and 4. In Fig. 3 the reset shaft 2 is turning in a clockwise direction with reference to the indicating wheel 1 and the pawl 19 has become interposed between the notch 11 having the shoulder part 12 and the stop shoulder 18 formed at the open segment of the hub 13. With such positioning of the pawl, the indicating wheel 1 becomes locked to the reset shaft 2 and must rotate therewith. In Fig. 4 the shaft is turning in a counterclockwise direction and in so doing has moved the resilient leaf spring pawl 19 away from the stop shoulder 18 and out of the notch 11. The pawl 19 thus simply bears against the outside portion of the rotating reset shaft 2 and offers only a slight frictional resistance to the rotation thereof. Thus, as illustrated in Fig. 4, the shaft 2 rotating in a counterclockwise direction, is disengaged from the wheel 1 and turns freely thereof.

In the embodiment of this invention, shown particularly in Figs. 2 and 8, the shaft contains a series of longitudinal notches 11 in alignment at intervals therealong, each notch 11 being positioned to receive the pawl from a particular indicating wheel. It will be appreciated, however, that a single long notch could be provided in the shaft rather than the series of notches positioned in end-to-end relation as illustrated.

Changes may be made in the form, construction and arrangement of the parts without departing from the spirit of the invention or sacrificing any of its advantages, and the right is hereby reserved to make all such changes as fall fairly within the scope of the following claims.

The invention is hereby claimed as follows:

1. In a counting device having a reset shaft with a longitudinal notch therein, a molded plastic indicating wheel rotatably mounted on the shaft, said wheel comprising a cylindrical surface having indicia thereon, ten radial teeth spaced uniformly about the wheel on one side of the cylindrical surface, a single tooth positioned on the other side of the cylindrical surface, a hub portion centrally positioned in the wheel, all of said teeth and said hub portion being molded integrally with the body of the wheel, said hub portion having a segment removed therefrom therby forming a shoulder stop, a leaf spring pawl attached to the body of the wheel, said pawl having a part extending into the hub where the segment is removed and engageable with the notch of the reset shaft, said pawl being operable to interpose between the notch of the shaft and the shoulder stop of the wheel hub thereby positively engaging the wheel to the shaft when the shaft is rotated in one direction with respect to the wheel and being operable to move away from the notch and the shoulder stop and thereby releasing the shaft from the wheel when the shaft is rotated in the opposite direction.

2. In a counting device having a reset shaft with a longitudinal notch therein, a molded plastic indicating wheel rotatably mounted on the shaft, said wheel comprising a cylindrical surface having indicia thereon, ten radial teeth spaced uniformly about the wheel on one side, a single tooth spaced on the other side, said single tooth having a groove opening inwardly toward the shaft, a hub portion centrally positioned for journaling the wheel on the reset shaft, said hub having an open segment thereby providing a shoulder stop closely adjacent to the reset shaft, and a leaf spring pawl attached to the body of the wheel, said pawl having a part receivable within the groove in the tooth and having another part extending from the groove to the open segment of the hub and engageable with the notch on the reset shaft, said pawl being operable to interpose between the notch and the shoulder stop of the wheel hub thereby positively engaging the wheel to the shaft for one direction of rotation and being operable to move from the notch and from the shoulder stop permitting free rotation in the other direction.

3. In a counting device having a reset shaft with a longitudinal notch therein, an indicating wheel rotatably mounted on the shaft, said wheel comprising a peripheral rim having a cylindrical surface with indicia thereon, a hub, a disc portion extending between the rim and the hub, ten radial teeth spaced equally about one side of the wheel and positioned adjacent to the disc portion, a single radial tooth positioned on the other side of the wheel, the rim, the hub, the disc portion and all of the teeth being integrally molded from nylon material, said hub having an open segment exposing the reset shaft and providing a shoulder stop in spaced relation with the notch, a leaf spring pawl attached to the disc portion and having a part extending into the open segment of the hub and engageable with the notch in the shaft, said pawl being operable to interpose between the shoulder stop of the hub and the notch of the shaft thereby locking the wheel to the shaft for rotation in one direction and operable to move from the notch and the shoulder stop thereby freeing the wheel from the shaft for rotation in the other direction.

4. In a counting device having a reset shaft with a longitudinal notch therein, an indicating wheel rotatably mounted on the shaft, said wheel comprising a peripheral rim having a cylindrical surface with indicia thereon, a hub, a disc portion extending between the rim and the hub, ten radial teeth spaced equally about one side of the wheel and positioned adjacent to the disc portion, a single radial tooth positioned on the other side of the wheel, the rim, the hub, the disc portion and all of the teeth being integrally molded from nylon material, said hub having an open segment exposing the reset shaft and providing a shoulder stop in spaced relation with the notch, one of said teeth having internal surfaces forming a groove opening inwardly of the wheel, a leaf spring pawl attached to the disc portion, said pawl having a part receivable into the groove in the tooth and another part extending from the groove to the open segment of the hub and engageable with the notch in the shaft, said pawl being operable to interpose between the shoulder stop of the hub and the notch of the shaft thereby locking the wheel to the shaft for rotation in one direction and operable to move from the notch and the shoulder stop thereby freeing the wheel from the shaft for rotation in the other direction.

5. In a counting device having a reset shaft with a longitudinal notch therein, an indicating wheel rotatably mounted on the shaft, said wheel comprising a peripheral rim having a cylindrical surface with indicia thereon, a hub, a disc portion extending between the rim and the hub, ten radial teeth spaced equally about one side of the wheel and positioned adjacent to the disc portion, a single radial tooth positioned on the other side of the

wheel, the rim, the hub, the disc portion and all of the teeth being integrally molded from nylon material, said hub having an open segment exposing the reset shaft and providing a shoulder stop in spaced relation with the notch, said single radial tooth having internal surfaces forming a groove disposed inwardly toward the shaft and in a plane with the shoulder stop of the hub, said pawl having a U-shaped part receivable in the groove in the tooth and having a straight part extending from the groove to the open segment of the hub, said straight part having an end adapted to protrude past the shoulder stop and engage the notch in the shaft, said pawl being operable to interpose between the shoulder stop of the hub and the notch of the shaft thereby locking the wheel to the shaft for rotation in one direction and operable to move from the notch and the shoulder stop thereby freeing the wheel from the shaft for rotation in the other direction.

6. In a counting device having an indicating wheel rotatably mounted on a reset shaft, a pawl for permitting rotation of the wheel relative to the shaft in one direction and for preventing rotation in the other direction, said pawl comprising a U-shaped part, a shaft engaging part, a straight part extending between one leg of the U-shaped part to the shaft engaging part, and a part for attachment with the wheel being integral with the U-shaped part.

7. In a counting device having an indicating wheel rotatably mounted on a reset shaft, a pawl for permitting rotation of the wheel relative to the shaft in one direction and for preventing rotation in the other direction, said pawl comprising a single leaf of thin metal formed generally into a U-shaped part with a pair of legs extending therefrom, one leg being substantially straight and having a broadened shaft engaging part at the end thereof, the other leg having a part adapted for attachment with the wheel.

8. In a counting device having an indicating wheel rotatably mounted on a reset shaft, a pawl for permitting rotation of the wheel relative to the shaft in one direction and for preventing rotation in the other direction, said pawl comprising a single flat leaf of spring steel formed into a U-shaped part with two legs extending therefrom, one of said legs being substantially straight and terminating in a broadened portion adapted for engagement with the reset shaft, the other leg having a part turned at an angle to the plane of the U-shaped part and adapted for attachment to the indicating wheel.

9. In a counting device having an indicating wheel rotatably mounted on a reset shaft, a pawl for permitting rotation of the wheel relative to the shaft in one direction and for preventing rotation in the other direction, said pawl comprising a single leaf of spring steel having a U-shaped part with two legs extending therefrom, the first of said legs being substantially straight and terminating in a part adapted for engagement with the reset shaft, said U-shaped part and said first leg being flat and lying generally in a single plane, the second of said legs having a part turned perpendicular to the plane of the U-shaped part and the first leg and being adapted for attachment to the indicating wheel.

10. In a counting device having a plurality of rotatably mounted indicating wheels, apparatus for resetting the indicating wheels to a zero indication, said apparatus comprising a reset shaft having at least one longitudinally extending notch therein, said notch having an abutting shoulder along one side thereof, said indicating wheels being rotatably mounted on said reset shaft, each of said indicating wheels including a hub with a segment removed therefrom, a shoulder stop being formed by a surface of the removed segment adjacent to the shaft, said stop surface being movable into spaced relation with the longitudinal notch in the shaft as the wheel rotates upon the shaft, and a leaf spring pawl attached to the

wheel, said pawl being positioned to extend across the shoulder stop and into the notch to interpose between the shoulder stop and abutting shoulder of the notch to prevent rotation of the wheel relative to the shaft in one direction, said pawl being operable to move resiliently from the shoulder stop when the wheel rotates in the other direction.

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