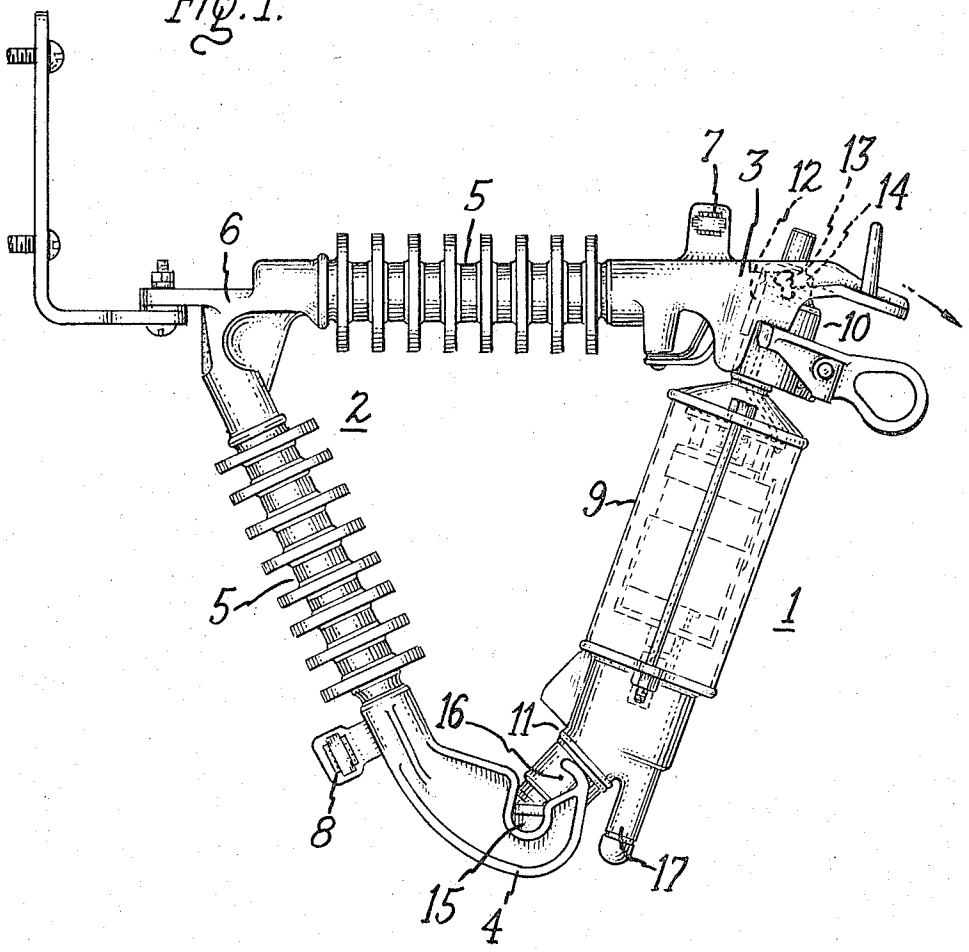
Jan. 30, 1968 R. E. KOCH 3,365,956

SECTIONALIZER FOR OPEN CUTOUTS

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Fig. 1.

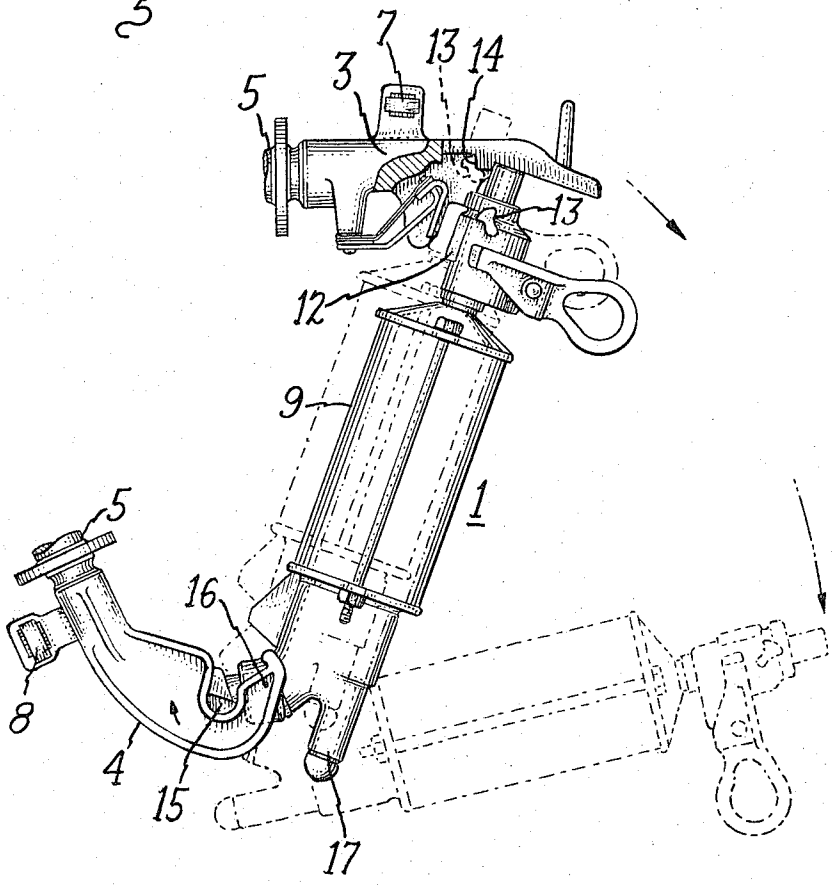


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SECTIONALIZER FOR OPEN CUTOUTS

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Fig. 2.



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Fig. 3.

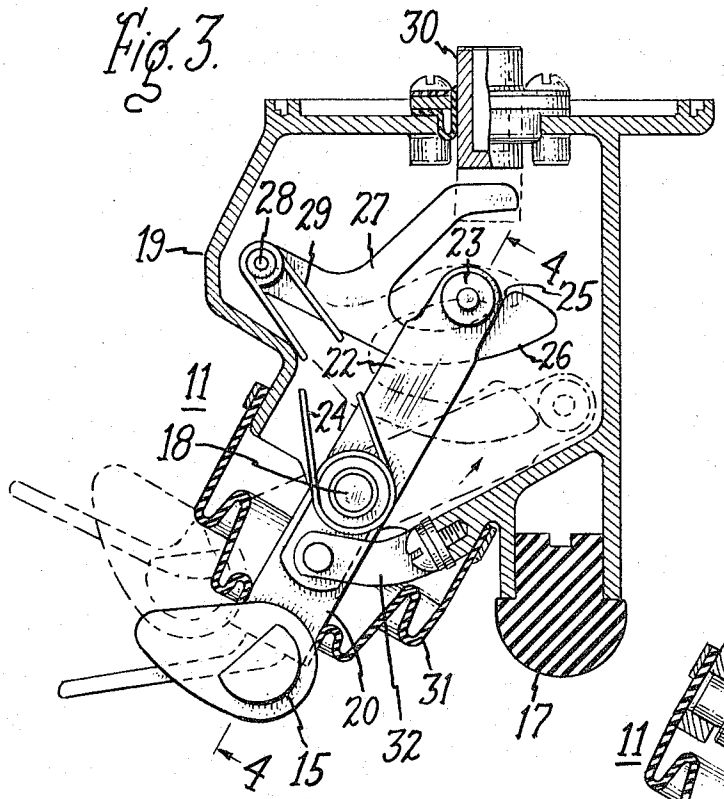


Fig. 4.

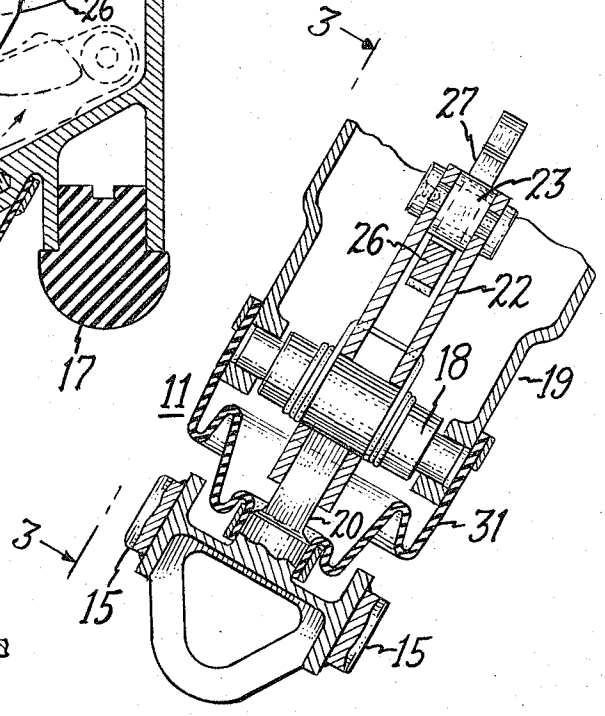
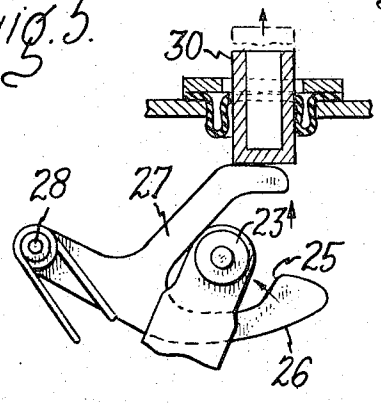


Fig. 5.



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SECTIONALIZER FOR OPEN CUTOUTS

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Fig. 6.

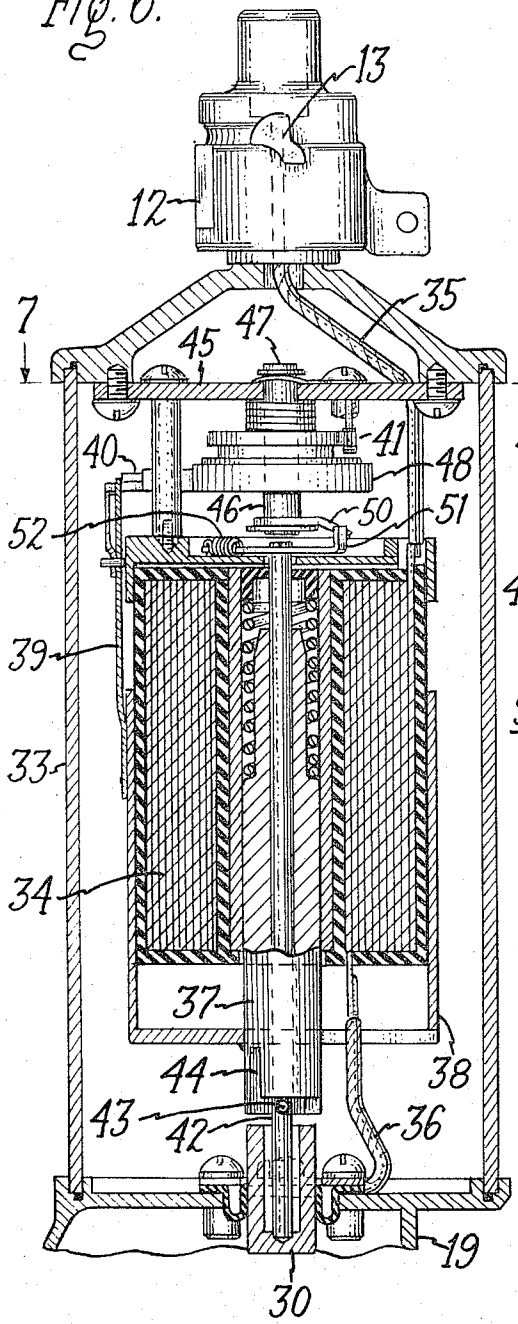
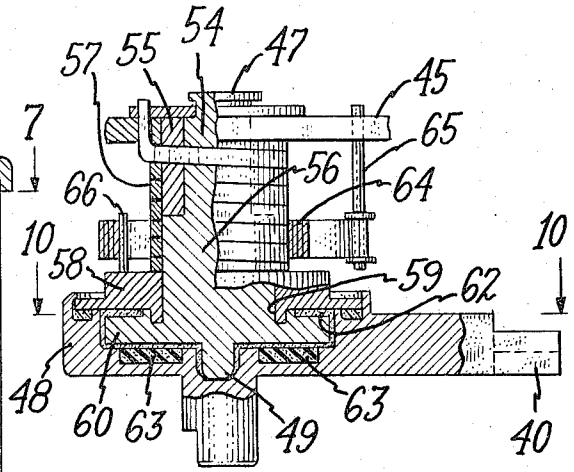
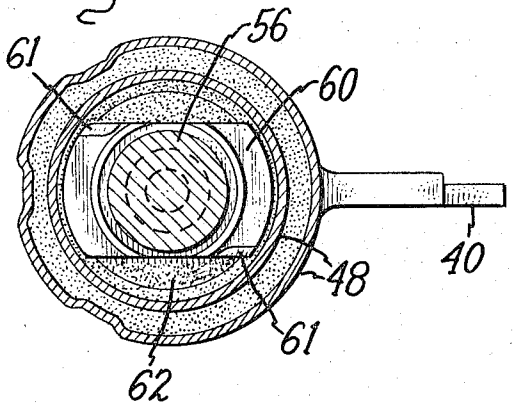


Fig. 9.



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Fig. 10



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Fig. 7.

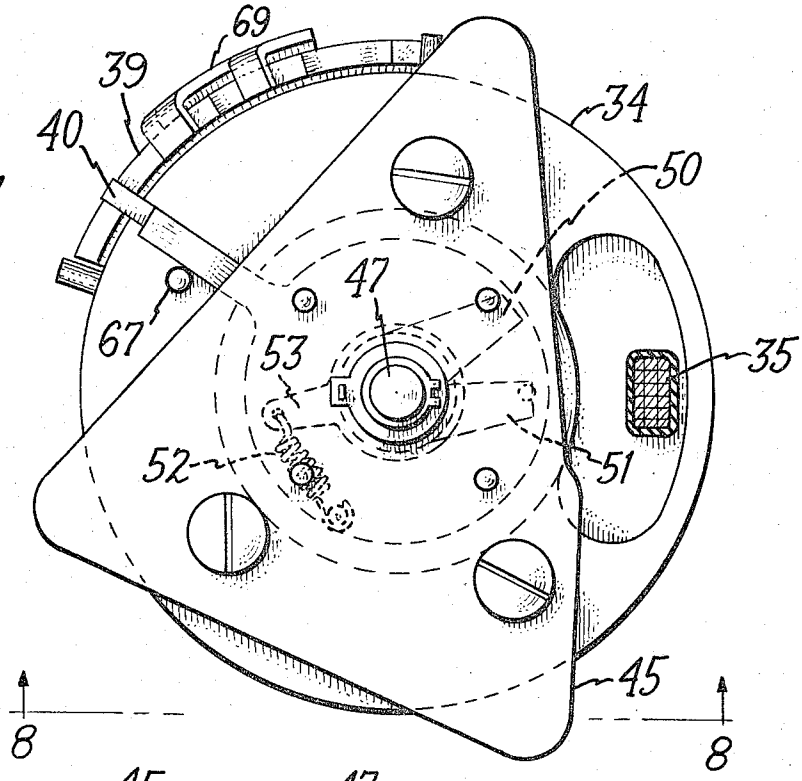
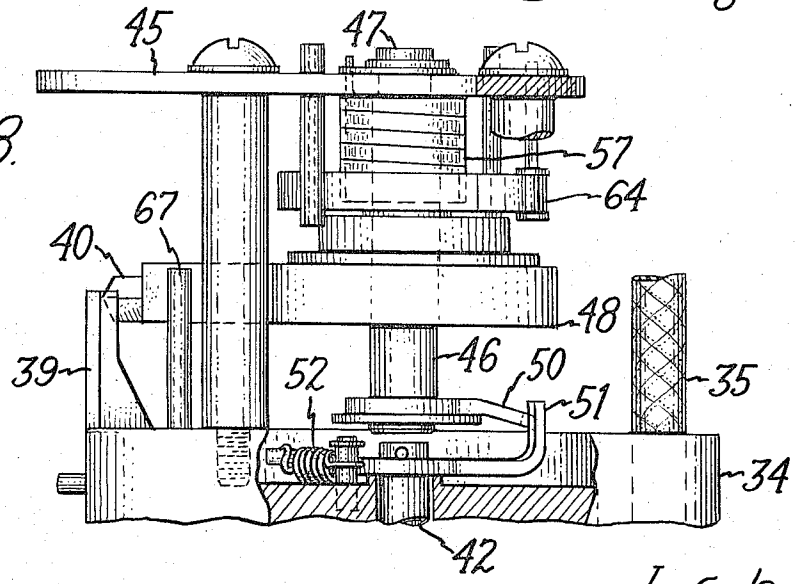


Fig. 8.



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Fig. 11

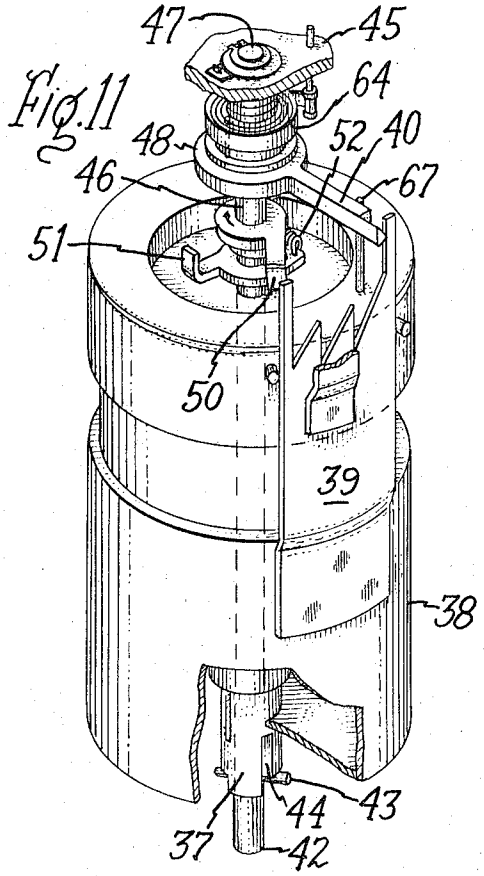


Fig. 11a.

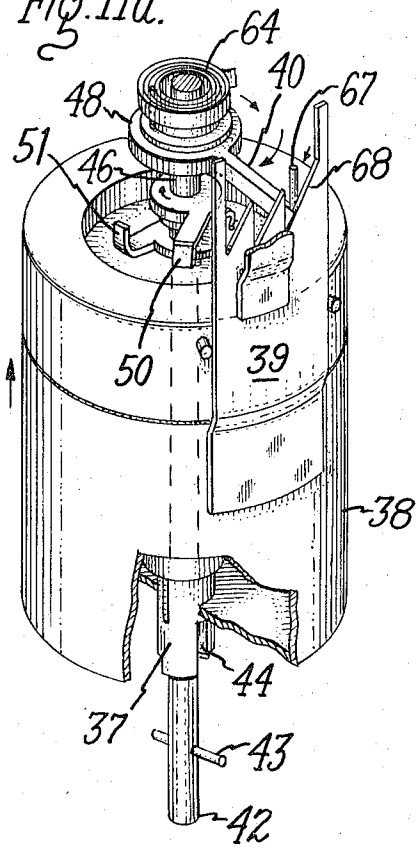
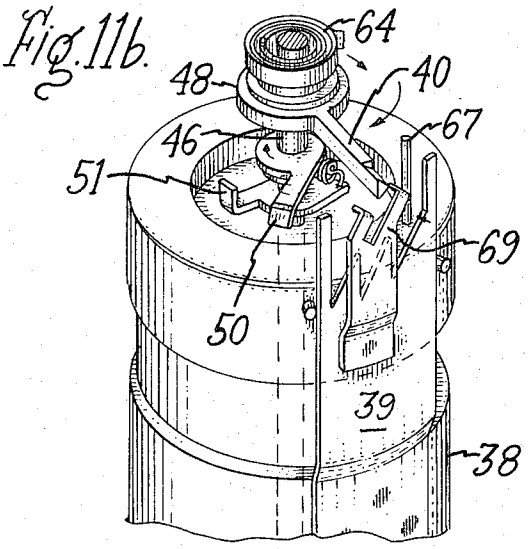


Fig. 11b.



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United States Patent Office 3,365,956 Patented Jan. 30, 1968

3,365,956

SECTIONALIZER FOR OPEN CUTOUTS

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Filed Nov. 16, 1965, Ser. No. 508,036
7 Claims. (Cl. 74—2)

ABSTRACT OF THE DISCLOSURE

An improved open cutout type line sectionalizer having a resetting collapsible toggle linkage and an asymmetrically responsive viscous fluid timer.

This invention relates to overcurrent protective devices and more particularly to improvements in line sectionalizers of the type comprising the subject matter of application Ser. No. 507,395 filed Nov. 12, 1965, now patent No. 3,321,721 in the name of Sidney R. Smith, Jr., and assigned to the present assignee.

A line sectionalizer is an adjunct of an automatic recloser. It is connected in circuit with, but on the load side of, the latter and like the latter it is a normally closed circuit disconnector which opens in response to overcurrent. Unlike a recloser, however, it does not open at once upon the occurrence of overcurrent and it does not automatically reclose after it has opened. What it does is count impulses of overcurrent resulting from the cycling action of the recloser and before the recloser locks open it locks open, thus sectionalizing the line by removing the presumably faulted section on its load side so that the recloser can reset itself and maintain service on the rest of the circuit. But for the sectionalizer, the recloser would lock open and terminate service on the entire load side of its circuit. In other words, a sectionalizer allows the recloser to maintain service on the entire circuit if the condition, usually a fault, causing the overcurrent is temporary, and it removes only the faulted section of the circuit if the fault is permanent.

Suitable locations for line sectionalizers are where branch circuits connect to a main feeder containing a recloser. Many such locations already contain an open type fuse cutout.

Accordingly, an object of the invention is to provide a new and improved line sectionalizer which can be inserted in an open cutout frame in place of the usual fuse tube.

Another object of the invention is to provide a releasable latch toggle mechanism for a sectionalizer which mechanism is provided with a new and improved reset construction.

A further object of the invention is to provide a new and improved timer mechanism for a sectionalizer.

The invention will be better understood from the following description taken in connection with the accompanying drawings and its scope will be pointed out in the appended claims.

In the drawings,

FIGURE 1 is a side elevation view of a preferred embodiment of the invention in its normal operating position,

FIGURE 2 is a view similar to FIG. 1 showing successive positions of the sectionalizer when it is opening,

FIGURE 3 is a sectional view taken on line 3—3 of FIG. 4 of the collapsible supporting toggle mechanism of the sectionalizer,

FIGURE 4 is another sectional view of the collapsible supporting mechanism taken on line 4—4 of FIG. 3,

FIGURE 5 is a detail view showing the resetting action of the mechanism illustrated in FIGS. 3 and 4,

FIGURE 6 is a longitudinal mid-sectional view of the counting mechanism of the sectionalizer,

FIGURE 7 is a plan view of the same mechanism taken on line 7—7 of FIG. 6,

FIGURE 8 is a side elevation view of the structure shown in FIG. 7 when viewed in the direction of the arrows on the section line 8—8 of FIG. 7,

FIG. 9 is a vertical mid-sectional view of the timer mechanism,

FIGURE 10 is a cross sectional view taken on line 10—10 of FIG. 9,

FIGURES 11, 11*a*, and 11*b* are perspective views of the counting and timer mechanism showing successive stages or positions of its parts during a counting sequence of the mechanism.

Referring now to the drawings and more particularly to FIG. 1, the sectionalizer, as indicated generally at 1, is mounted in an open cutout frame indicated generally at 2. The cutout frame 2 comprises a so-called latch casting 3 and hook casting 4 supported at the outer ends of separate resilient insulator members 5 joined at their other ends by a common yoke casting 6. The latch casting 3 has a line terminal 7 integral therewith and the other casting has a line terminal 8 integral therewith. The sectionalizer 1 comprises a middle section 9 containing the counting mechanism, an upper latched contact assembly 10 and a lower collapsible toggle supporting assembly 11. The latched contact assembly 10 comprises a contact face 12 for engaging a contact on the latch casting 3 and latching ears 13 for engaging notches 14 in the latch casting 3. The mechanism 11 comprises trunnions 15 mounted in the hook casting 4. This mechanism when it breaks or releases pivots about an axis 16 as more clearly shown in FIG. 2.

Referring now to FIG. 2, the full line showing of the sectionalizer illustrates the breaking or pivoting of the toggle support around the point 16 allowing the sectionalizer to drop from the dashed line position corresponding to that of FIG. 1 so that the latching ears 13 slip out of the notches 14 allowing the sectionalizer 1 to pivot about the trunnions 15 and drop open as indicated by the right-hand dashed showing of the sectionalizer. This downward swinging motion is limited by a bumper stop 17.

The mechanism 11 is shown in FIGS. 3, 4, and 5. As shown in these figures, there is a main lever pivotally mounted at 18 in a housing 19. This lever has an outwardly extending portion 20 terminating in the trunnions 15 and an inwardly extending bifurcated end 22 between whose tines a roller 23 is mounted. A spring 24 tends to rotate the lever 20–22 clockwise as viewed in FIG. 3 to its unlatched or collapsed position shown in dashed lines. The lever 22 is held in its latched position as shown in sold lines by a catch 25 on the lower tine 26 of the bifurcated end of a second lever 27 pivotally mounted at 28 in the casing 19. A spring 29 tends to rotate the lever 27 into its latched position. The mechanism is unlatched by a reciprocal plunger or button 30, which when pushed down to its dotted position shown in FIG. 3 will rotate the lever 27 thus releasing the catch 25 and allowing the arm 20–22 to rotate clockwise until the parts are in the position shown in dotted lines in FIG. 3. This showing indicates that the roller 23 cannot slip past the end of the tine 26 so that reverse rotation of the lever 20–22 if carried far enough will automatically recatch or reset the mechanism. However, in order to insure a positive return stroke of the tripping button 30, and resetting of the mechanism which operated it the roller 23 will engage the upper tine of the bifurcated end of the lever 27 thus positively raising it and correspondingly resetting the tripping button 30 as shown in FIG. 5. When the

parts are released, they will then spring back to the caught position illustrated in the full line shown in FIG. 3.

The mechanism is sealed by a rubber boot 31 clamped between the housing 19 and the outer end of the lever 20 near its trunnions. A flexible conductor strap 32 serves to make a positive electrical connection between the metallic housing 19 and the lever 20 with its trunnions 15.

Referring now to FIG. 6, the counting mechanism 9 is housed in a cylindrical container 33 and comprises a strip wound solenoid coil 34 connected by a lead 35 to the contact 12 and by a lead 36 to the housing 19 so that the solenoid coil is directly connected in series between the line terminals 7 and 8 of the device. A solenoid plunger 37 is mounted for reciprocal motion in the bore of the solenoid coil 34, and it has attached thereto an external cup 38 surrounding the coil and having attached to its outer surface a ratchet plate 39 for indexing an arm 40 associated with the timer mechanism indicated generally at 41. The plunger 37 is hollow and extending therethrough is a rod or shaft 42 with its lower end seated in the tripping button 30 and extending to beyond the top of the solenoid coil. A transverse pin 43 in the shaft 42 normally serves to limit the downward gravity and/or spring biased movement of the plunger 37, but as will be explained later a predetermined number of strokes of the plunger and cup within a predetermined time will cause the shaft 42 to be rotated until the pin 43 is in registration with a slot 44 in the plunger whereby the plunger can drop and push the button 30 down so as to cause the toggle mechanism to release in the manner previously described.

The timer mechanism 41 is supported from a plate 45 and comprises principally a second shaft 46 and a third shaft 47 mounted for relative coaxial rotation and extending coaxially relative to the first shaft 42. They are in effect journaled together in a cup member 48 of the timer at 49 in FIG. 9. The lower end of the shaft 46 carries a transverse arm 50 which is at a fixed angular relation to the ratchet arm 40 through the shaft 46 and the cup 48. The arm 50 serves to strike and move an arm 51 on the upper end of the shaft 42, the latter shaft being biased to its normal position by a spring 52 attached to an arm 53 integral with the arm 51. (See FIG. 7.)

As shown more clearly in FIG. 9, the third shaft 47 is of stepped construction, the smaller diameter portion 54 of which is seated in a journal bearing 55, and the larger diameter portion 56 of which abuts the end of the journal bearing 55 and has an outer diameter corresponding to the outer diameter of the journal bearing 55. Surrounding the journal bearing 55 and the larger diameter portion 56 of the shaft 47 is a close fit spiral brake spring 57 fixed at its upper end of the plate 45. This construction provides a virtually zero back lash slip brake, the spring being wound counterclockwise when looking down on it from the top, i.e. when looking down on FIGS. 7 or 8 so that clockwise rotation of the third shaft 47 will tend to unwind the spring and is thus permitted with relatively little friction, whereas counterclockwise rotation of the shaft 47 when viewed from the top will tend to tighten the spring 57 on the shaft and virtually lock it against rotation.

A cover 58 (see FIG. 9) closes the cup shaped member 48 through which the larger diameter portion 56 of the shaft 47 extends and is sealed by a labyrinth seal 59 between those parts. The lower end of the shaft 47 terminates in a so-called blade rotor 60 having beveled leading edges 61. The cup 48 is filled with a viscous fluid such as silicone gum 62 which is moved past the rotor 60 when there is relative motion between the cup 48 and the rotor 60. Pockets are provided in the bottom of the cup filled with a resilient non-porous material 63 to compensate for volume changes of the fluid due to its thermal expansion and contraction so as to prevent leakage of the fluid under these conditions.

A clock spring 64 surrounds the mechanism and has one end attached by a pin 65 to the plate 45 and the other end attached by a pin 66 to the cover 58 of the timer casing, this spring biasing the timer cup and arm 40 counterclockwise when viewed from the top against a stop pin 67 which determines the normal starting position of the counting mechanism.

The general operation of the ratcheting and counting mechanism is best illustrated in FIGS. 11, 11*a* and 11*b*. FIG. 11 shows the parts in their normal position with the arm 40 held against the stop 67 by the clock spring 64 and with a maximum angular displacement between the arm 50 on the shaft 46 and the arm 51 on the shaft 42, the latter being held in its normal position by the spring 52. On the first upward stroke of the solenoid plunger, cup 38 and ratchet plate 39, as illustrated in FIG. 11*a*, the inclined surface or first step 68 of the ratchet plate 39 will index or notch the arm 40 clockwise through a given angle thus also moving the arm 50 toward the arm 51. As soon as the solenoid coil is deenergized (by the opening of the recloser in the circuit), the cup 38 drops and an auxiliary ratchet finger 69 attached to the ratchet plate 39 strikes the top of the already indexed around arm 40 and indexes it through a further small angle in a clockwise direction as indicated by the new positions of the arms 40 and 50 in FIG. 11*b*. Successive recloser cycles will cause successive up and down strokes of the cup 38 thus progressively indexing the arms 40 and 50 around until on the last upward stroke, this being the third in the mechanism illustrated, the arm 50 will strike the arm 51 and rotate the shaft 42 until the pin 43 engages the slot 44 thus allowing the plunger 37 on its final downward stroke to fall past the pin 43 and depress the button 30 to trip out and open the sectionalizer in the manner previously described.

Ordinarily the cyclic up and down motion of the ratchet plate 39 will be relatively rapid and powerful and the rotor 60 and the timer cup 48 will both turn as a unit due to the viscosity of the fluid and the rapidity of the motion, this being permitted by the one way brake action of the spring 57 which offers little resistance to clockwise rotation of the shaft 47. However, whenever the arm 40 moves away from the stop pin 67 and is not being positively indexed in a clockwise direction by the ratchet, the clock spring 64 acts to return it slowly to its normal position against the stop 67. This action results from the clamping of the shaft 47 by the spring 57 when the shaft 47 tends to rotate counterclockwise so that the clock spring 64 must then overcome the drag of the rotor 60 in the fluid 62 in the cup 48. In order that this drag not be excessive, the leading edges of the rotor 60 are beveled at 61 so that the rotor in effect will cut through the viscous fluid.

While there has been shown and described a particular embodiment of the invention, it will be obvious to those skilled in the art that changes and modifications may be made without departing from the invention, and therefore it is intended by the appended claims to cover all such changes and modifications as fall within the true spirit and scope of the invention.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a line sectionalizer, a collapsible supporting linkage therefor comprising, in combination, a housing having a first lever pivotally attached thereto near the bottom thereof, said lever having an outwardly extending end with a pair of transverse trunnions attached thereto and an inwardly extending end with a transverse projection thereon, a second lever pivotally mounted at one end in said housing and having its other end bifurcated and embracing said projection and having a catch on its lower tine for latching said projection, and a reciprocable member in said housing for engaging the upper tine of the bifurcated end of the second lever for moving it to release the first lever, said first lever when returned to

beyond its latched position engaging said upper tine of the bifurcated end of said second lever and servicing to rotate said second lever to cause its upper tine to reengage and positively reset said reciprocable member.

2. In a line sectionalizer, a collapsible supporting linkage therefor comprising, in combination, a housing having a first lever pivotally attached thereto near the bottom thereof, said lever having an outwardly extending end with a pair of transverse trunnions attached thereto and an inwardly extending bifurcated end with a roller therein, a second lever pivotally mounted at one end in said housing and having its other end bifurcated and embracing said roller and having a catch for latching said roller, and a reciprocable member in said housing for engaging the bifurcated end of the second lever for moving it to release the first lever, said first lever when returned to beyond its latched position engaging said upper tine of the bifurcated end of said second lever and serving to rotate said second lever to cause its upper tine to reengage and positively reset said reciprocable member.

3. In a line sectionalizer, a timer mechanism for permitting rapid movement of an element in one direction from a normal position and causing slow automatic return of said element to said normal position in the opposite direction comprising, in combination, a one way slip brake, a viscous fluid coupling between said one way slip brake and said element, and a spring operatively connected between said element and a fixed anchor for urging said element against a fixed stop which determines said normal position, whereby when said element is moved rapidly in said one direction said brake slips and when said element is released said brake holds and said viscous fluid coupling delays the spring biased return movement of said element.

4. A line sectionalizer timer as in claim 3 in which said fluid coupling has means for accommodating thermal expansion and contraction of its fluid.

5. A line sectionalizer timer as in claim 3 in which said fluid coupling has an asymmetrical part movable relative to its fluid more easily in one direction than in the opposite direction.

6. In a line sectionalizer, a timer comprising, in combination, a stepped shaft having a small diameter section rotatably mounted in a fixed journal bearing and a large diameter section adjacent said bearing and of substantially the same diameter as the outer diameter of said bearing, a close fitting spiral brake spring around said bearing and around the adjacent large diameter portion

of said shaft whereby rotation of said shaft in one direction tends to unwind said brake spring whereas rotation in the opposite direction tends to tighten said brake spring and produce a virtually zero back lash strong frictional braking action on said shaft, a transverse plate on the end of the large diameter section of said shaft, a cup enclosing said plate and an integral laterally extending arm on said cup, a viscous fluid in said cup, a cover for said cup through which said shaft extends, said cover being sealed at the edges of said cup and providing a fluid tight journal bearing for said shaft whereby said cup and arm can rotate relative to said plate, a coil spring operatively connected between said cup and a fixed anchor, for biasing said cup in such angular direction that the torque transmitted to said plate by said fluid tightens said brake spring, the leading edge of said plate being beveled to reduce said torque.

7. A timer for a sectionalizer comprising, in combination, a cup shaped member mounted for free rotation about its axis, a ratchet pawl arm extending radially from said cup shaped member, a coil spring operatively connected between said cup and a fixed anchor for biasing said cup shaped member and arm in a given angular direction against a stop, a shaft extending axially of said cup and having a transverse blade in said cup, said shaft having a brake spring means so wound as to tend to tighten itself on said shaft when said shaft rotates in said given angular direction and to loosen itself on said shaft when said shaft rotates in the opposite angular direction, a quantity of silicone gum filling said cup, a cover sealingly closing said cup and having a labyrinth seal around said shaft whereby said blade in said gum offers maximum resistance to rotation of said cup and arm in said given angular direction and minimum resistance to rotation of said cup and arm in the opposite direction, said blade having a square edge on one side and a beveled edge on the opposite side with said square edge facing in said given angular direction whereby said gum offers less resistance to rotation of said cup and arm in said given angular direction relative to said blade than in the opposite angular direction relative to said blade.

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