Dec. 22, 1959 F. L. EVERETT 2,918,514

BREAKER MECHANISM FOR DEFERRED-ACTION BATTERIES

Filed April 18, 1944 2 Sheets-Sheet 1

FIG. 1

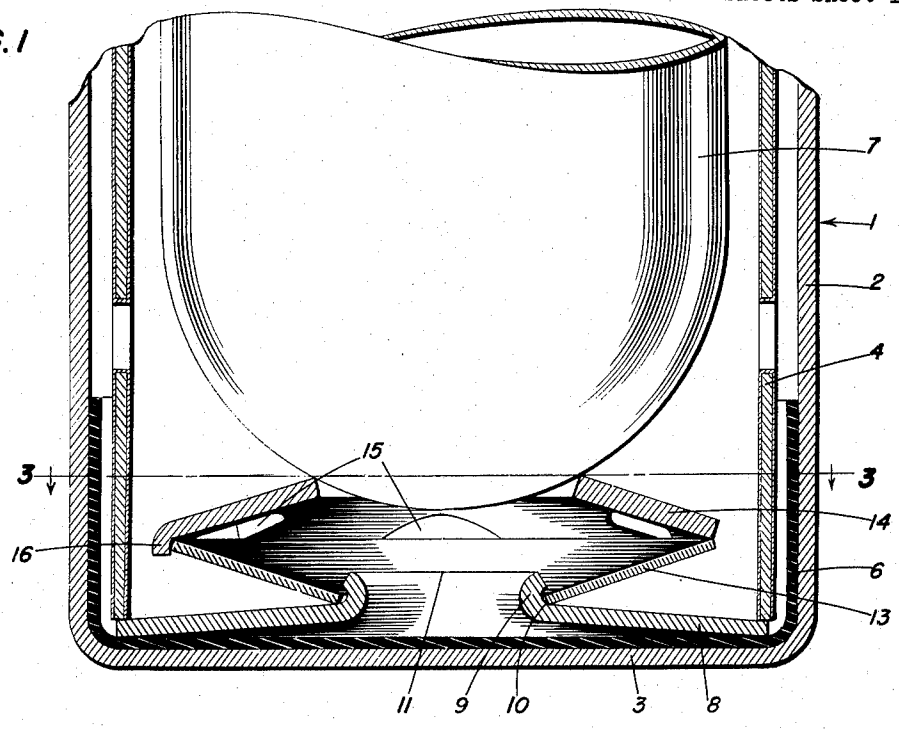
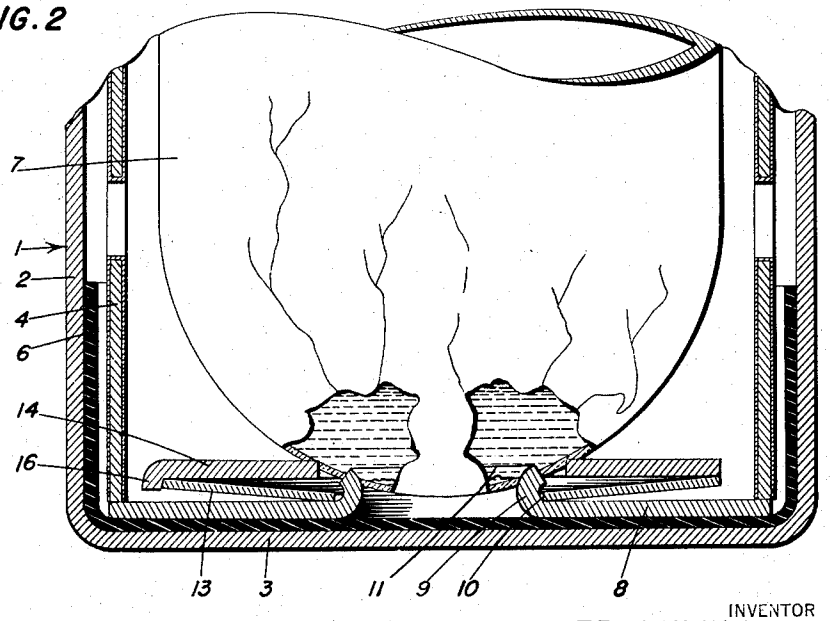


FIG. 2



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Filed April 18, 1944 2 Sheets-Sheet 2

FIG. 3

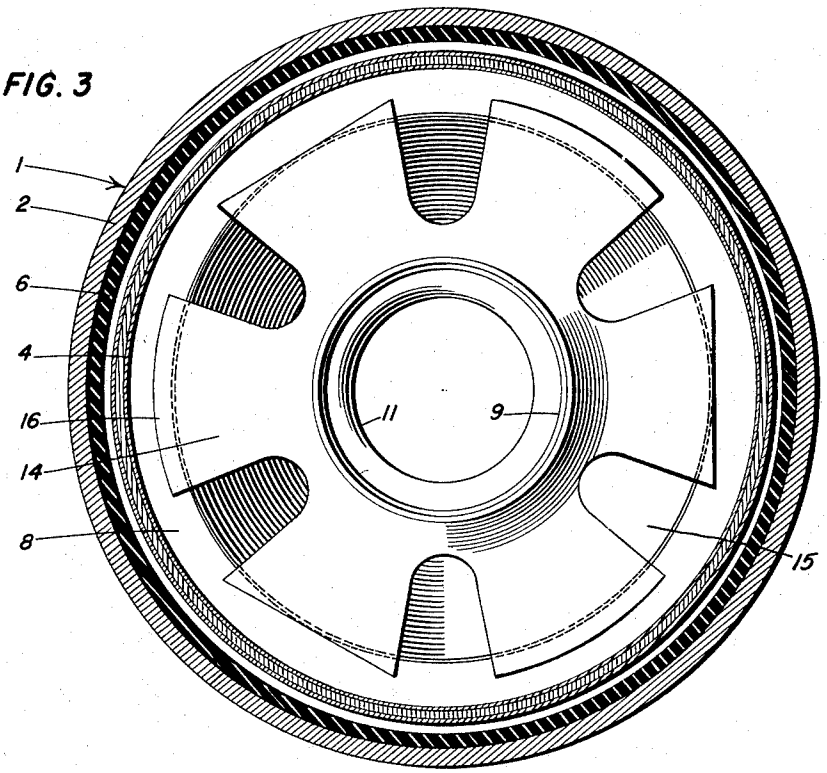
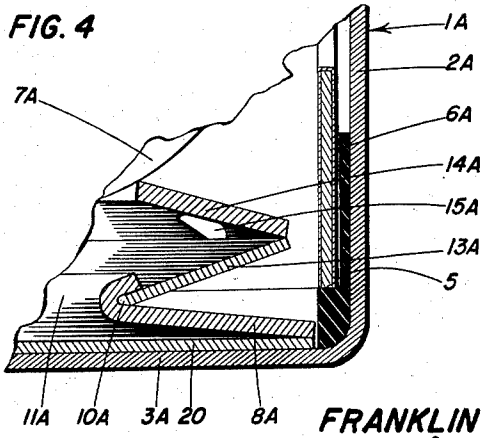


FIG. 4



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2,918,514

BREAKER MECHANISM FOR DEFERRED-ACTION BATTERIES

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Application April 18, 1944, Serial No. 531,597

9 Claims. (Cl. 136—90)

This invention relates to an improved breaker mechanism for use in wet cells of the type, commonly known as "deferred action batteries," wherein a fluid electrolyte is sealed in a frangible ampoule so mounted as to be broken when it is desired to activate the cell, to permit the liquid or fluent electrolyte to contact the electrodes. This breaker mechanism is of the same type as that which is embodied in applicant's co-pending application, Serial Number 502,069, filed September 11, 1943, now Patent No. 2,901,525, issued August 25, 1959.

One of the principal objects of the invention is to provide an improved combined supporting and breaker mechanism incorporating semi-resilient mounting means for the ampoule arranged in such manner that premature breakage thereof will largely be prevented.

Another object of the invention is to provide a breaker mechanism which will cause shattering of the ampoule when it is subjected to the force of setback in an accelerating projectile, but which protects the ampoule against unwanted breakage under lesser or differently applied forces.

A further object of the invention is to provide a mechanism of this character wherein all of the elements employed are semi-resilient, so that maximum cushioning effect for the ampoule will be realized.

A further object of the invention is to provide an improved breaker mechanism characterized by extreme simplicity and which is highly efficient in operation.

Other objects of the invention will become apparent as the description proceeds.

In the drawing:

Fig. 1 is a vertical substantially diametric sectional view of the lower portion of a battery incorporating my improved breaker mechanism;

Fig. 2 is a view similar to Fig. 1 showing the parts in the positions they assume under setback, with the ampoule in the act of being shattered;

Fig. 3 is a cross section taken substantially on the line 3—3 of Fig. 1 and looking in the direction of the arrows, with the ampoule removed; and

Figure 4 is a fragmentary vertical section of a somewhat modified construction.

Referring now to the drawing in more detail the numeral 1 indicates generally the case of a deferred action battery of known type. The case is preferably formed of zinc and includes a side wall 2 and a bottom wall 3, the side wall defining the anode of the battery. Carried within the casing is a sleeve 4 which defines the cathode of the battery. The sleeve is preferably formed of steel coated with carbon and rests upon the top surface of the base washer 8 of the breaker mechanism (presently to be described). The cathode sleeve is spaced within and insulated from the anode can 1 by an insulating cup 6 fitted in the bottom of the can and extending part way up the side walls thereof.

At 7 I have shown fragmentarily the ampoule which is normally carried within the battery. The ampoule 7 is formed of glass or other frangible material and is

adapted to contain a fluent electrolyte, such as a solution of chromic acid and stannic chloride in water.

My improved combined cushioning and breaker mechanism includes a base washer 8 which is substantially frusto-conical in shape and which is upwardly and outwardly folded at its top (at 9) to define an annular groove 10. The upper end of the folded bead 9 is cut at such angle as to provide an upwardly directed knife edge 11 surrounding the central opening of the washer. The base washer 8 is of resilient material and is centrally positioned in the casing by the cup 6. An intermediate spring washer 13 which is of similar but inverted frusto-conic shape fits in the groove 10 of the bead 9, which is turned thereover in the assembly of these parts. The washer 13 is of somewhat less diameter than base washer 8 and is about one-half as thick, providing a greater degree of flexibility. Fitted over and retained upon washer 13 is a supporting washer 14, also frusto-conic in shape. As best seen in Fig. 3, the body of the washer 14 is fashioned with spaced notches or recesses 15 that form a series of radial tongues having inturned retaining lugs 16 which enclose the outer edge of the washer 13; the presence of the notches 15 also enhances the resiliency of this washer 14. The central opening of spring washer 14 forms a seat for the lower end of the ampoule 7.

In use, when a projectile carrying a battery equipped with my improved breaker mechanism is accelerated in the firing of a gun, the ampoule 7 thereof is shifted rearwardly within the casing by the force of setback, and driven against the annular knife edge 11 of rim 9 of the washer 8, breaking the ampoule and permitting activation on the battery. The manner in which the washers are flattened in this action is clearly illustrated in Fig. 2. Washer 13 is of such resiliency as to provide the major cushioning effect, but will, when sufficient pressure is brought to bear upon it, snap to collapsed position to permit the ampoule to contact the breaker portion 9 of the washer 8.

In the course of normal handling of projectiles equipped with such deferred action batteries, washers 8, 13 and 14 cooperate to provide a resilient mounting for the ampoule preventing accidental breakage. In this connection attention is called to the fact that, all of the washers being made of semi-resilient material and mounted in the manner shown, maximum cushioning effect for the ampoule is afforded.

In the somewhat modified construction shown in Figure 4 of the drawing, the ampoule is supported by a similar "Belleville spring" assembly which rests upon a pad 20 fitted in the bottom of the can 1A, the insulating sleeve 6A which projects upwardly between cathode 4A and the anode can 1A being of special configuration and having an inwardly directed shoulder 5 at its lower extremity upon which the cathode rests. The retaining flange 9A formed on the bottom spring section 8A to hold the intermediate spring section 13A is in this embodiment not provided with a special knife configuration, the force of the impact being relied upon to effect breakage. Other portions of this embodiment similar to parts already described have been given like reference characters, distinguished by the addition of the letter "A" to each, and are believed to require no detailed redescription.

I claim:

1. In a primary cell construction including a casing, an ampoule of frangible material movably mounted in the casing and adapted to contain the electrolyte for the cell, means yieldably opposing movement of the ampoule in the casing, said means comprising an assembly of opposed springs, compressible under inertial forces resulting from the mass of the ampoule upon sufficiently rapid acceleration of the casing, and a breaker portion carried by the assembly and engageable by the ampoule

to fracture the latter upon occurrence of such compression, the opposed springs of said assembly comprising a plurality of resilient washers of a variant thickness and of substantially truncated conic form.

2. A primary cell construction as defined in claim 1, in which said assembly comprises a plurality of opposed resilient frusto-conic washers of variant thickness, at least one of said washers having substantially radial recessed portions forming tongues extending inwardly from the periphery thereof.

3. A primary cell construction as defined in claim 1, wherein said assembly comprises a plurality of opposed, resilient, frusto-conic spring metal washers of variant thickness, one of said washers having a central opening forming a seat for the ampoule, said breaker portion being arranged beneath said opening and engageable therethrough by the ampoule upon occurrence of such compression to a predetermined degree.

4. A primary cell construction as recited in claim 1, wherein said spring assembly comprises a plurality of resilient, substantially coaxial frusto-conic washers alternately engaged at their inner and outer peripheries and alternately converging in opposite directions, one of said washers having an enlarged central opening forming a seat for the ampoule, and another having a combined locking bead and breaker portion of lesser diameter folding over and retaining the inner periphery of an adjacent washer and engageable through the first mentioned opening by the ampoule upon occurrence of a predetermined degree of compression of said spring asesmbly.

5. In a deferred action battery adapted to be activated under a force of setback and having a frangible ampoule for containing an electrolyte, a collapsible support for the ampoule comprising a head against which the ampoule is movable by a force of setback to break the ampoule, a concave-convex snap action spring disk centrally mounted on the head and having its concave surface facing the ampoule, an annular disk mounted on the rim of said first disk for supporting the ampoule in spaced relation to the head, and fingers on one of said disks and extending over the periphery of the other disk for maintaining said disks in mounted relation.

6. In a deferred action battery adapted to be activated under a force of setback and having a frangible ampoule for containing an electrolyte, a collapsible support for the ampoule comprising a head against which the ampoule is movable by a force of setback to break said ampoule, a concave-convex snap action spring disk centrally mounted on the head and having its concave surface facing the ampoule, an annular disk mounted on the rim of said first disk for supporting the ampoule in spaced relation to the head, and fingers on the snap action disk extending over the periphery of the annular disk for holding said disks together.

7. In a deferred action battery adapted to be activated under a force of setback and having a frangible ampoule for containing an electrolyte, a collapsible support for the ampoule comprising a head against which the ampoule is movable by a force of setback to break said ampoule, a concave-convex snap action spring disk centrally mounted on the head and having its concave surface facing the ampoule, an annular disk mounted on the rim of said first disk for supporting the ampoule in spaced relation to the head, and fingers on the annular disk extending over the periphery of the snap action disk for holding said disks together.

8. In a breaker mechanism for supporting an ampoule in a deferred action battery, the combination of two spaced open center frusto-conical spring washers, an intermediate inverted open center frusto-conical spring washer, and co-acting means on adjoining washers for retaining them in axial alinement.

9. In a breaker mechanism for supporting an ampoule in a deferred action battery, the combination with a breaker element, of a pair of opposed open center frusto-conical spring washers, one of which forms a seat for the ampoule, co-acting means on the washers retaining them in axial alinement with the breaker element, and co-acting retaining means on the breaker element and the other washer.

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