June 29, 1954 H. H. PORTER 2,682,567

BREAKER MECHANISM FOR FRANGIBLE AMPULE IN DEFERRED ACTION BATTERY

Filed Feb. 5, 1944

FIG. 1

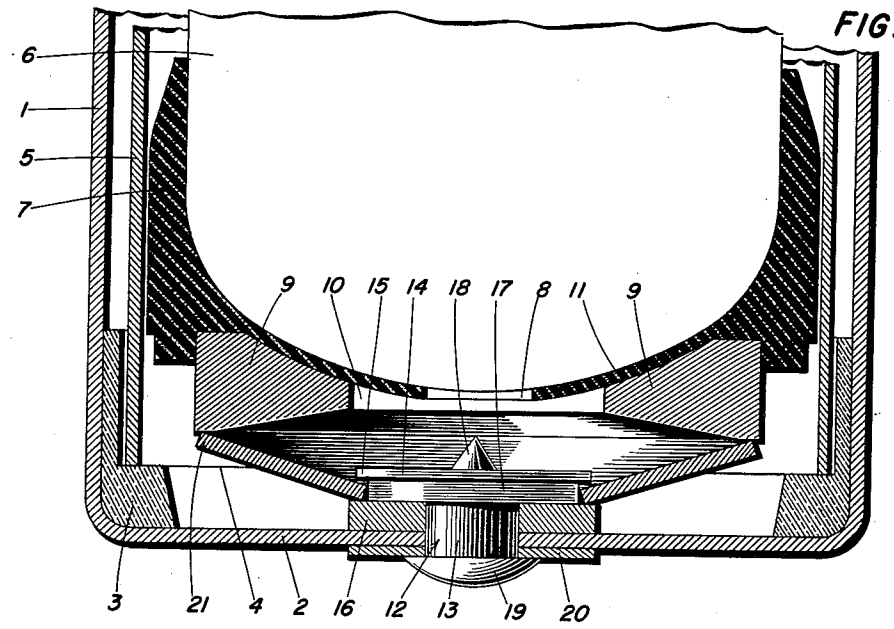
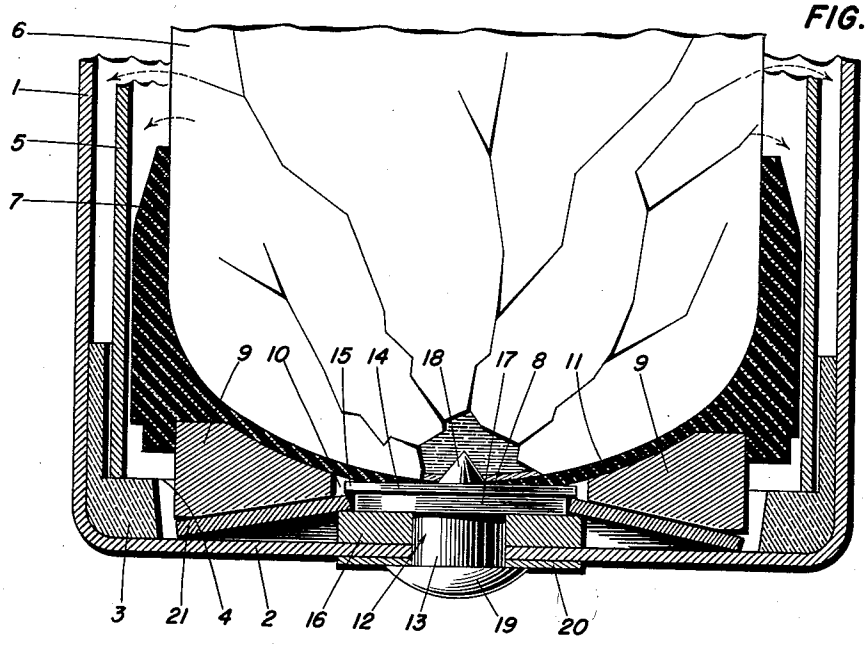


FIG. 2



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BREAKER MECHANISM FOR FRANGIBLE AMPULE IN DEFERRED ACTION BATTERY

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4 Claims. (Cl. 136—90)

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This invention relates generally to deferred action or voltaic batteries of the type used with electrically detonated projectiles and more particularly to an improved breaker mechanism, constituting a further development of the invention disclosed in the copending application of Franklin L. Everett, Serial No. 502,069, filed September 11, 1943, for "Breaker Mechanism."

In said Everett case there is disclosed a somewhat similar device, but in which the spring washer that supports the ampule is initially cupped oppositely to the one herein embodied, that is, in the present case the spring washer initially has its outer edge portion uppermost, and the said outer edge portion of said washer directly or indirectly supports the ampule, whereas in the Everett case the spring washer has its central opening uppermost, and the central portion supports the ampule. This is the line of demarcation between the two cases.

In deferred action batteries developed up to the present time the supporting mechanism for the frangible ampule employed has been found not to be entirely reliable for the reason that the tolerances do not always remain constant. More particularly, the distance between the pointed end of the breaker element and the lower end portion of the ampule may be varied by buckling of the bottom wall of the battery can. As a result, the breaker mechanism is often positioned to close to the ampule, and premature breaking of said ampule sometimes takes place.

One of the principal objects of the invention, therefore, is to provide a breaker mechanism which is so constructed that the distance between the end of the breaker element and the lower extremity of the ampule will remain constant, even if the battery can is considerably bent or buckled.

Another object of the invention is to provide a breaker mechanism affording improved support for the ampule.

A further object of the invention is to provide a mechanism of this character which will afford resilient support for the ampule, so that premature breakage will be largely prevented.

Still another object of the invention is to provide a breaker mechanism which is characterized by its extreme simplicity of construction.

Other objects of the invention, not mentioned hereinabove, will be evident from the following description, taken in conjunction with the drawing forming a part hereof.

Fig. 1 is an axial sectional view showing the improved breaker mechanism, also showing adjacent portions of a deferred action battery in which the mechanism is installed.

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Fig. 2 is a view similar to Fig. 1, illustrating the result of the setback action.

Referring more particularly to the drawing, the numeral 1 indicates generally the inner can of a deferred action battery of the type used with electrically detonated projectiles. The can 1 is of metal, and is of generally cylindrical shape. Closing said can at its lower end is a bottom wall 2. Mounted within the can 1, adjacent to the bottom wall 2 and the side wall of said can, is a supporting sleeve 3 which is formed of plastic and which is provided with a shoulder 4. Located in the can 1, concentrically thereof, is an electrode 5. This electrode cooperates with the side wall of the can in defining the A-cell of the deferred action battery. Fitted within the electrode 5 is an ampule 6 which is formed of glass or other frangible material and is designed to contain a suitable electrolyte. The ampule 6 is formed with a rounded bottom portion which is supported in a cup 7 of soft rubber, said cup having an axially located opening 8 at its lower end. The cup 7 is mounted on a thrust element or supporting ring 9 and said supporting ring is formed with an axial opening 10 and a concave seat 11, such seat being designed to receive the lower end of the cup 7. To further the latter purpose, the cup has an exterior annular flange forming a recess into which the upper portion of the ring 9 extends. If desired the cup 7 may be omitted, a desirable degree of resiliency then being supplied by the ring or thrust element 9 which may be formed of resilient material.

Fixed on the bottom wall 2 of the can, axially thereof, and in alignment with the opening 8, is a head or breaker element assembly 12. The breaker element includes a shank 13 which terminates at its upper end in an enlarged disc 14, said disc having an overhanging flange 15 which cooperates with a spacing washer 16 to define an annular groove 17. The breaker element assembly 12 is also provided with an upwardly projecting breaker point 18 and is headed below the can at 19, a spacing washer 20 being interposed between the head and can. The washers 16, 20 are clamped tightly enough to seal the can, although solder or the like may be used in addition if desired.

The ampule 6, the cup 7 and the ring 9 are supported above and in spaced relation to the breaker element by a Belleville washer in the form of an inverted frusto-conical spring 21. As

will be seen, the spring is formed with an axial neck opening which defines an inner rim, the inner rim being normally received in the groove 17. The outer rim of the washer or spring 21 engages the lower surface of the ring 9. It will thus be understood that the spring 21 normally supports the ampule above the breaker element 12, but suddenly snaps into inverted condition when sufficient force is applied. In other words, the spring washer 21 is normally concave upward as shown in Fig. 1, but suddenly snaps into the condition shown in Fig. 2, wherein it is concave downward. Such snap-action spring washers are known commercially as Belleville washers.

The spring 21 resiliently opposes contact between the lower end of the ampule 6 and the breaker point 18. The resistance of the spring is such that these parts cannot be thrown into contact by forces or shocks of the order encountered during the handling of projectiles prior to firing thereof.

It should be noted that the spring 21 is supported by the breaker element assembly and not by the bottom wall. Thus, if the bottom wall is caused to move inwardly by forces such as those present when assembling these parts into their outer case, the ampule will be caused to move the same distance. It will therefore be seen that the distance between the upper end of the breaker point 18 and the lower end of the ampule 6 will always remain substantially constant under ordinary loadings and forces.

During setback, the resistance produced by the inertia of the ampule is such that the point 18 is driven into it and the ampule broken, the spring 21 being compressed. The cell is thus charged with electrolyte and rendered effective. In event of a slower movement or distortion of the can causing forward movement of its bottom wall, and of the point 18, however, such as might occur during rough handling or for any other reason prior to firing, the spring 21 simply moves the ampule bodily in the same direction without permitting contact between the breaker point and ampule.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. In a deferred action cell having electrodes and a frangible container containing the electrolyte, means for ensuring the breakage of said container when the cell is to be put into service, said means including a breaker having a projection adjacent the container, and a snap-action washer of the Belleville type, having its initially concave side toward the said container, and its outer edge portion supporting the container, said washer normally maintaining the projection a constant distance out of contact with the container but yieldable upon application of sufficient force, to cause the projection to enter and break the container.

2. In a deferred action cell as defined in claim 1, a breaker having an abutment and a projection extending from the said abutment toward the container, the snap-action washer bearing against said abutment and against said container to keep them normally separated by a constant distance.

3. In a deferred action battery adapted to be activated under a force of setback and having a frangible ampule for containing an electrolyte, a collapsible support for the ampule comprising a head against which the ampule is movable by a force of setback to break the ampule, a concave-convex snap action disk centrally mounted on the head and having its concave surface facing the ampule, and a seat mounted on the rim of the disk for supporting the ampule in spaced relation to the head.

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

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
287,924	Gruson et al.	Nov. 6, 1883
823,681	Gulick	June 19, 1906
1,311,678	Cartwright	July 29, 1919
2,336,701	Rasmussen	Dec. 14, 1943
2,403,567	Wales	July 9, 1946

FOREIGN PATENTS

Number	Country	Date
305,287	Germany	Apr. 18, 1918
526,800	Great Britain	Sept. 25, 1940

OTHER REFERENCES

Ashworth, G., Proceedings Institute Mechanical Engineers, vol. 155, No. 16 (1946), page 98.