

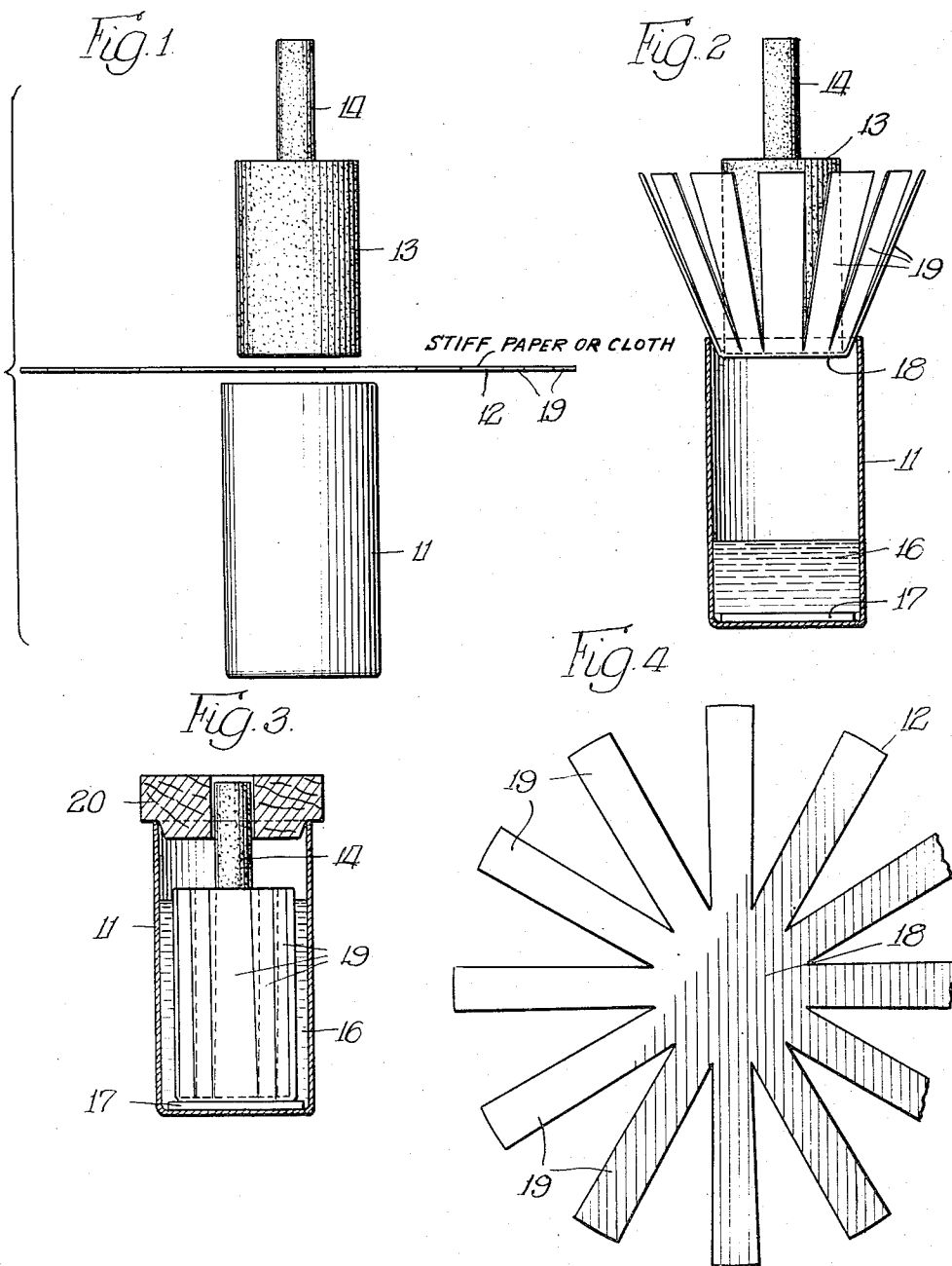
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GALVANIC CELL AND METHOD OF MAKING SAME

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GALVANIC CELL AND METHOD OF MAKING
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This invention relates to a new and improved construction for galvanic cells and method of assembling the same. It relates specifically to the type of cells commonly called "dry cells" and used either individually or assembled in multiples to produce batteries of higher voltage than a single cell.

Cells of this character are divided into several classes according to their structure and method of manufacture and assembly. The present invention relates to cells of the kind called "bag type." Other types of cells include paper lined cells in which the electrode can is lined with paper and the core compressed directly into the lined can. They also include unwrapped cells in which the core is fabricated separately and introduced naked into the can, spacer means being provided to maintain the core in spaced relationship to the inner wall of the can electrode.

The bag type cell comprises a core consisting of a carbon pencil and a mixture of depolarizing material about the lower portion of the core, the depolarizing material being enclosed in a bag. The bag may comprise cheesecloth wrapped around the core and held in place by rubber bands or by thread, tape or cords, or porous paper or other material rolled around the cylinder, usually with its edges folded under to partly or wholly cover the base of the core, and the bag held in place by suitable means such as described. The characteristic of the bag type core is that the core is fabricated separately from the can and when inserted in the can it is covered by suitable material to prevent contact between the can and core. When the cell is completed, the core is separated from the can by an annular layer of gelatinous electrolyte.

The core of this type of cell usually comprises a depolarizing mixture of manganese dioxide, carbonaceous material, ammonium chloride, zinc chloride and water prepared as a damp, fairly coherent mass which is given form by compression. However, the compressed cores are fragile and are easily broken or deformed by ordinary commercial methods of handling and disintegrate and flake off rapidly when placed into a liquid. This characteristic presents numerous problems, but the use of cores is highly desirable from a commercial manufacturing standpoint, and the bag serves to retain the shape of the core and to prevent its disintegration and the flaking off of particles when it is brought into contact with ungelatinized electrolyte and during the time necessary to convert the electro-

lyte from a milky fluid to a relatively stiff gelatinous consistency.

The maintenance of the physical form of the core and the prevention of disintegration after the core has been placed in the zinc cup is essential to the production of a satisfactory commercial cell, as the flaking off of any particles of depolarizing material and the collection thereof adjacent the bottom of the cell between the core and the zinc cup will cause short circuits or set up local action therein which will entirely destroy the usefulness of the cell or so materially shorten its life that it will fall below the standards now demanded for dry cells.

In dry cells of the bag type, the core of depolarizing materials is made of less diameter than the zinc can and the space between the core and the can is occupied by an electrolyte mixture which is rendered non-flowable by the gelatinizing action of some suitable agent such as starch, cereal or similar material. This is necessary in the type of cell referred to in order to eliminate the presence of a flowable liquid which would leak out of the cell and cause damage to the appliance with which it is used.

Cheesecloth has heretofore been considered a necessary material for the "bag" for this type of cell because of its absorption and porosity whereby cheesecloth offers little or no resistance to the passage of the ungelatinized mixture, and further its use largely avoids the formation of insulating pockets of air between the core and the bag. The efficiency of a dry cell of this type depends upon the maintenance of its composing elements in proper intimate contact throughout its electrolytic life, and the avoidance of air films, bubbles and voids of any kind.

The applicant is aware of efforts that have been made in the past to find a suitable substitute for cheesecloth, which is a comparatively expensive material. United States Patent No. 1,956,243 by the applicant together with Johnson, Jensen, Ruhoff, Schroeder and Krueger, represents one important effort. While the construction taught in this patent is a distinct improvement upon the then existing art, and many million cells have been made in accordance with its teachings, there has been a constant effort to eliminate much of the hand labor which is necessary. United States Patent No. 2,088,307 by the applicant, together with Ruhoff and Schroeder, and United States Patent No. 2,095,421 by applicant, together with Ruhoff and Krueger and Schroeder, illustrate efforts along this line. The two last mentioned patents disclose methods of

eliminating the "bag" from the bag type cells. However, after considerable use it has been found that there are numerous dangers attendant upon the use of this so-called "unwrapped" type of construction. It has been found that when the cores are inserted manually into the zinc cups that frequently the side wall of the core is brought into contact with the upper edge of the zinc cup and thus scraping off sufficient conductive material from the core which falls between the core and the zinc cup, to cause local action or a direct internal short circuit. Up to the present time it has been found impractical to insert the naked cores into the zinc cans mechanically. Further, unless the naked core has been thoroughly brushed and cleaned of adherent particles of "mix", the "mix" will be easily washed from the core and fall to the bottom, bridging the space between the core and the can and causing defective cells.

The present invention is an improvement upon that of the prior patent of applicant et al. No. 1,956,243 above mentioned, for it retains all the desirable characteristics of the older invention and provides new and novel features. The shape of the wrapper allows the electrolyte to flow freely through the arms of the wrapper and contact both the core and the zinc cup completely. This improves the shelf life and electrical capacity of the cell. It also minimizes the labor necessary for wrapping the core. This construction allows the electrolyte to contact both the can and core as effectively as any unwrapped core construction, and also provides as much protection against accidental damage to the core during assembly and against internal short circuits as any wrapped core construction now in use. As the core and the wrapper are inserted into the zinc cup, the arms of the wrapper turn up around the core, preventing any possible loose particles getting between the core and the zinc cup, thus giving complete protection against any short circuits.

It is an object of the present invention to provide a new and improved galvanic cell and to provide a method of making the same.

It is a further object to provide a bag type of cell construction in which the core bag or covering member is held in position by the can.

It is also an object to provide a method of assembly by which the bag is formed to the core in the step of assembling the core in the can.

It is another object to provide a cell comprising a bag which may be formed of cheap material, such as paper or fibrous sheets.

It is an additional object to provide a method of assembling core, bag and can, in which the bag fully covers the core while providing adequate free area for rapid flow of the electrolyte to the core.

It is a further object to provide a construction which comprises low cost materials and which reduces the amount of manual labor required in fabricating the cell so that the cell may be made with production speeds equal to those of an unwrapped core while providing all of the protective features of the wrapped core.

It is also an object to provide a dry cell with a wrapped core of such a construction that the electrolyte contacts both the core and zinc cup quickly and intimately by reason of the fact that the electrolyte is not obstructed by rubber bands, tape or thread or by a wrapper pressed into tight contact with the core, and that therefore the electrolyte can easily force out any air bubbles

from the cell assembly, thus providing a cell having a high degree of capacity and shelf life.

Other and further objects will appear as the description proceeds.

I have shown certain preferred embodiments of my invention in the accompanying drawing, in which—

Figure 1 is an elevational view with the core, bag and can in position for assembly;

Figure 2 is an elevational view, with the can in section, showing the core and bag partly assembled in the can;

Figure 3 is a vertical section through the can of a cell with the bag and core in place and centered; and

Figure 4 is a plan view, partly broken away, of the bag blank in flat form.

Referring first to Figure 1, the zinc can, which serves as the negative electrode of the cell, is shown at 11. Above it is located the bag blank 12 which is centered so that its central base portion is located above the opening in the can 11. The core 13 is shown above the bag blank 12, this core including the carbon pencil 14, the pencil being embedded in the compressed mass of depolarizing material.

In Figure 2, the can 11 is shown in section and contains a quantity of liquid electrolyte 16 adequate in amount to fill the space between the core and bag, and can when the core is inserted. The insulating disc 17 is located in the bottom of the can 11, this disc being normally made of heavy waxed paper or similar insulating material. The core 13 is shown as partly inserted into the upper end of the can 11, this insertion forcing the central portion 18 of the bag blank 12 downwardly into the mouth of the can, with the fingers or strips 19 of the bag extending upwardly at an angle, being folded in toward the core by the downward movement of the core.

In Figure 3 the core and its enclosing bag are completely assembled in the can and the temporary spacing cover 20 of wood or other suitable insulating material has been inserted in the top of the can to engage the central electrode to center the core while the electrolyte 16 is being gelatinized. The further assembly of the cell takes place in the usual manner, the member 20 being removed after the electrolyte has set and the upper end of the cell closed by any usual closure means. The cell may then be wrapped for individual use and sold, or assembled in multiple cell blocks by any usual method.

The circular center or base portion 18 of the bag blank is preferably substantially equal in area to the interior of the can 11. The fingers or strips 19 are located immediately adjacent each other and are of such width and length that they completely enclose and cover the core when it is fully inserted in the can. The strips overlap each other, providing continuous openings from top to bottom of the core whereby the electrolyte may pass between the fingers into contact with the core. The strips 19 also extend to the top or preferably slightly above the upper edge of the core but need not be folded down upon the upper face of the core. The numerous relatively large slit openings between the overlapping strips 19 permits the electrolyte to very quickly reach the core so as to closely contact it and drive out air which may otherwise be entrapped between the core and wrapper, which is free to pass out at the upper end of the core between the core and bag. Since the electrolyte passes freely through the slits between the over-

lapping strips 19, there is no tendency for the material of the bag to filter out the starch or other gelatinizing agent which has been added to the electrolyte. Therefore, the electrolyte which contacts the depolarizing mix of the core is full strength and contains the gelatinizing agent so that when the cell is heat treated this portion of the electrolyte is also gelatinized.

The bag blank 12 may be made of any suitable material, such, for example, as porous paper or starched or otherwise stiffened cheesecloth, muslin, crinoline or other foraminous material. The width of the overlapping strips 19 is such that they have no tendency to buckle or crinkle in the assembly, but remain substantially flat and in mutually overlapping relationship, forming a covering layer but not filling the space between the core and can. The material need not be sufficiently porous for the electrolyte to flow instantly through it, since the original quick flow during assembly takes place between the overlapping fingers. The material, however, should have a porosity such that there is a complete bond of the electrolyte through the area of the material in the completed cell, so that the bag does not serve as a barrier. It is important that the bag be made of relatively stiff material both for ease of assembly and in order that the bag may take the proper position after assembly. A reasonably stiff disc or blank is more easily handled in assembly and more easily centered, which cuts down labor costs and faulty manufacture. An example of a material of suitable stiffness is the paper used in kraft toweling stock. It is very important, however, in assembly that the overlapping strips 19 be reasonably stiff in order that they are directed upwardly and overlap in the assembly without excessive wrinkling or crushing. With soft material lacking in stiffness the strips or fingers would tend to slide down on the core and wrinkle or wad toward the bottom of the can, serving merely as a spacer but not completely covering the core, which is the function of the bag. It is important, therefore, that the bag be formed of material which is not only stiff originally but which will remain substantially stiff at least through the short period between assembly and the gelatinizing of the electrolyte.

While certain preferred embodiments of the invention have been shown and described, these are to be understood to be illustrative only, as it is capable of variation and change to meet differing conditions and requirements and I contemplate such modifications as come within the spirit and scope of the appended claims.

What is claimed is:

1. An electrical cell of the bag type, comprising a zinc cup, a wrapped core of compressed depolarizing mixture and an embedded carbon pencil in said cup with a space between the wrapped core and the sides of the cup, a gelatinized electrolyte in said space, the wrapper for said core being of porous, reasonably stiff sheet material comprising an imperforate portion extending over the base of the core and separate strips extending up the sides of the core from the imperforate base portion and covering at least the major portion of the sides of the core.
2. An electrical cell of the bag type, comprising a zinc cup, a wrapped core of compressed depolarizing mixture and an embedded carbon pencil in said cup with a space between the wrapped core and the sides of the cup, a gelatinized

electrolyte in said space, the wrapper for said core being of porous, reasonably stiff sheet material comprising a portion extending over the base of the core and separate, overlapping strips extending up the sides of the core from the base portion to substantially enclose the core.

3. An electrical cell of the bag type, comprising a zinc cup, a wrapped core of compressed depolarizing mixture and an embedded carbon pencil in said cup with a space between the wrapped core and the sides of the cup, a gelatinized electrolyte in said space, the wrapper for said core being of porous, reasonably stiff sheet material comprising an imperforate portion extending over the base of the core and separate, overlapping strips extending up the sides of the core from the imperforate base portion, said strips being integrally united to the imperforate base portion and extending approximately adjacent the upper edge of the compressed depolarizing mixture.

4. An electrical cell of the bag type, comprising a zinc cup, a wrapped core of compressed depolarizing mixture and an embedded carbon pencil in said cup with a space between the wrapped core and the sides of the cup, a gelatinized electrolyte in said space, an insulating member between the bottom of the core and the cup, the wrapper for said core being of porous paper comprising a portion extending over the base of the core and separate strips extending up the sides of the core from the base portion and substantially enclosing the core.

5. An electrical cell of the bag type, comprising a zinc cup, a wrapped core of compressed depolarizing mixture and an embedded carbon pencil in said cup with a space between the wrapped core and the sides of the cup, a gelatinized electrolyte in said space, an insulating member between the bottom of the core and the cup, the wrapper for said core being of porous paper comprising a portion extending over the base of the core and separate, overlapping strips extending up the sides of the core from the base portion, said strips being integrally united to the base portion and extending at least to a point adjacent the upper edge of the compressed depolarizing mixture.

6. The method of making a dry cell which comprises centering a sheet of reasonably stiff porous material above the open end of a zinc cup, said sheet comprising a central disc portion and a plurality of relatively narrow strips extending radially therefrom, moving a naked core downwardly against the central portion of the sheet, and moving the core downwardly to force the central disc portion of the sheet to the bottom of the cup, the radial strips extending upwardly between the core and cup walls to enclose the core.

7. The method of making a dry cell which comprises centering a sheet of reasonably stiff porous material above the open end of a zinc cup, said sheet comprising a central disc portion and closely placed strips extending radially therefrom, moving a naked core downwardly against the central portion of the sheet, and moving the core downwardly to force the central disc portion of the sheet to the bottom of the cup, the radial strips extending upwardly in overlapping relation between the core and cup walls and their ends extending at least to a point adjacent the upper core edge to completely separate the core from the cup walls.