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CHEMILUMINESCENT LIGHTING ELEMENT

1 Devices able to emit light by the mixing of two liquid
2 chemicals are well known. May be cited the following U.S.
3 patents: 3 539 794, 3 576 987, 4 193 109, 4 682 544, 4 751
4 616, 4 814 949 and 5 121 302.

5 Generally speaking the proposed devices involve two
6 chambers, respectively containing the first liquid chemical,
7 named oxalate solution, and the second one, named activator
8 solution. These two chambers being separated by a wall which
9 can be broken by the user, or having a removable part. Said
10 wall should also be a good barrier against gases, because the
11 oxalate solution is sensitive to any contamination originating
12 either from outside or from the activator. Therefore, in
13 practice, save economically costly exceptions, the oxalate
14 solution is enclosed in a breakable glass ampoule.
15 Unfortunately, it is not possible to continuously manufacture,
16 starting from material in roll form, elements with glass
17 ampoules. Moreover, they are expensive.

18 The present invention relates to an element idoneus for
19 such a continuous manufacture, thus very economical, and what
20 is more, with constitutive materials being very cheap. The
21 element has furthermore the advantage of being flat, of being
22 particularly light, as well as other auxiliary advantages

1 which will appear in the following exposé.

2 More particularly, the invention proposes a
3 chemiluminescent lighting element involving at least two
4 chambers filled respectively with an oxalate solution and an
5 activator solution. The oxalate solution is in a tight-closed
6 pouch of thin aluminum foil, lined on its interior side by a
7 polymer, said pouch being a first chamber. This pouch is
8 itself enclosed in a bigger tight-closed pouch, made of
9 translucent polymeric film, being a second chamber, which also
10 contains the liquid activator chemical.

11 The element according to the invention is then
12 essentially comprising a pouch made of aluminum foil
13 containing the oxalate solution, disposed inside a pouch made
14 of translucent plastic film, containing also the activator
15 solution, and, optionally, an absorbing felt and a steel ball
16 or other hard particle, of which the role is to pierce the
17 aluminum pouch at the moment of use, under the effect of
18 manipulating by the user.

19 The invention will be better understood with reference to
20 the annexed drawings, shown as examples. In these drawings:

21 Fig. 1 represents a top plan view of the device according
22 to the invention;

23 Fig. 2 is a cross-sectional view of same;

24 Fig. 3 is a top plan view of another embodiment of the

1 invention, and

2 Fig. 4 is its matching cross-sectional view.

3 The inner pouch 1 is made of the two aluminum foils 2 and
4 3, sealed together along their periphery 4, -rectangular in
5 the fig. 1 and 2, and circular in the fig. 3 and 4.

6 It contains the oxalate liquid chemical solution, of
7 which the level is shown as 5. The outer pouch 6 is made of
8 two films 7 and 8, of translucent soft polymer, preferably
9 polyolefin, for instance polyethylen or polypropylene, sealed
10 along a periphery 9, - rectangular in the fig. 1 and 2, and
11 circular in fig. 3 and 4. It contains the activator liquid
12 of which the level is figured as 10.

13 The device involves, optionally, a steel ball 11 or a
14 hard particle on which the user will push in order to pierce
15 the aluminium pouch, and so induce the mixing process. It can
16 also be conceived, that this ball or particle be not used, and
17 that the pouch will be bursted by pressure. In that case, it
18 is suitable to foresee an area of weakened resistance, for
19 instance a welding line. Each of the two aluminium foils is
20 lined, by coating, laminating, or other technique, by a coat
21 of polymeric lacquer, on this one of their surfaces which is
22 to be faced to the corresponding one. This lacquer coat,
23 preferably based on a polypropylene, modified or not, is
24 provided to ensure the adhesion of the two foils together by

1 thermal sealing along their periphery. This coat is not
2 represented on the drawings for reasons of clarity.

3 This polymeric coat, in addition to adhesion, has also
4 the role of insuring a good compatibility between aluminium
5 material and the oxalate solution which is delicate and
6 sensitive to contaminations, and is compatible with only few
7 materials. This coat is very thin, in order not to increase
8 the mechanical resistance of the aluminium, which is due to
9 become broken.

10 In addition to this coat, it is possible to also foresee
11 the presence of a thin soft film of polypropylene between the
12 two aluminium foils. It will be prisoner between them by the
13 sealing and will contribute to the quality of said sealing.
14 It is not represented on the drawings, for reasons of clarity.
15 Of course the oxalate solution will be between this soft film
16 and one of the aluminium foils, the one to be pierced.

17 The device involves also, optionally, a felt 12
18 (succession of small crosses on the drawings) made of nonwoven
19 material of which the fibers are preferably from the same
20 polymer as the films of the outer pouch. It will be prisoner
21 between the two films by the peripheral thermal sealing.
22 During the storage of the lighting element before use, this
23 felt will have time to absorb the whole of the activator
24 liquid and spread it uniformly in the pouch. The result will

1 be a good uniformity in emitted light after the liberation of
2 the oxalate solution, because the two chemical liquids are
3 avid to diffuse into each other within a short time. The
4 level of activator liquid as figured in 10 in fig. 2, is the
5 one met at the time of filing; later, it will be absorbed in
6 the felt as said above.

7 Once emptied, or almost emptied, the aluminium pouch
8 remains in place and has a role of reflector; the whole of
9 luminous emission takes place indeed from the same side of the
10 aluminium pouch, -the pierced side. There is almost no liquid
11 at the other side. This intense unidirectional emission of
12 light is incontestably an advantage towards prior art in the
13 matter.

14 It is frequent that the inner pouch be not entirely
15 emptied by the user at the time of lighting-up. It has been
16 seen that some rests were remaining inside because of some
17 creases or other reasons. It is then advantageous, while the
18 light is weakening with the hours, due to the unavoidable
19 chemical energy consumption of the system, to handle the
20 element with some kneading action, in order to extract the
21 remains of oxalate solution contents out of the inner pouch.
22 One can then see a kind of regeneration of the luminous
23 emission, and this, at the moment decided by the user. This
24 is an appreciable advantage versus the prior art, vainly asked

1 for, until now, by the market.

2 In fig. 1 and 2 the element is figured under a rectangle
3 form, and in fig. 3 and 4, under a circular form, but of
4 course the peripheral sealing can have any other form, and,
5 particularly, for advertising or promotional purposes, be made
6 under the form of a brand logo.

7 For industrial manufacture, it is foreseen, with use of a
8 "fill-and-seal" type of packaging machine, to unroll, from
9 their respective storage rolls, the two aluminium foils, as
10 well, if any, the optional roll of soft polymer film, in order
11 to present face to face the coated sides of these aluminium
12 foils, and to seal successively the pouches in a continuous
13 and temporized way.

14 When the aluminium foils are face to face, one of them-
15 or both- is slightly embossed by a small punching tool,
16 mechanically actuated, this in view of creating some volume
17 for the liquid to be received. Then the injection of oxalate
18 solution is done, followed by the pouch sealing. Once sealed,
19 the pouches are separated by means of an automated knife, and
20 fall individually into the second machine, described
21 hereafter.

22 The machine can be of vertical type, as suggested by fig.
23 1 and 2, or of horizontal type, as suggested by fig. 3 and 4.
24 The embossing operation is easier in horizontal machine and

1 can be done on the inferior foil only.

2 The aluminium foils have been coated or laminated with
3 the polymeric lacquer mentioned hereabove, in the course of a
4 previous operation, which has also be done continuously by
5 known means.

6 A second machine, also of the "fill-and-seal" type,
7 receives in a sequential way, synchronously with the first
8 machine, the filled and sealed aluminium pouches, and seals
9 together the two soft plastic films, as well as the felt if
10 any, all three of them being continuously unrolled from their
11 storage rolls. Before sealing, a measured quantity of
12 activator liquid is introduced, as well as the ball.

13 It is important to note that in this second machine,
14 which manufactures the outer pouches (and this, contrarily to
15 what happens in the first machine with the aluminum foils) the
16 two films of flexible plastic, unrolled in view of the
17 operation, remain flat, i.e. not "embossed" or "deepdrawn"
18 until the moment of final sealing. They then take a slightly
19 swollen structure because at the sealing time, they cage
20 between them the aluminium pouch. This swelling is a purely
21 elastic deformation, with tensioning, due to the natural
22 elasticity of the films, by nature reversible. As a result
23 the walls of the outer pouch exert on the inner pouch and its
24 contents, an uniform elastic pressure of which the action is

1 very favorable at the moment of piercing by the user. The
2 oxalate liquid is then ejectioned with force, what favours the
3 desired mixing.

4 The completed pouches then go out from the exit of the
5 machine under the form of a chain, or sausage chain, and can
6 be supplied as such to the user, if he is interested by light
7 "in-line", -a novel item being of interest for instance for
8 police or army forces.

9 Of course the pouches can be separated from each other by
10 means of an automated knife, or by weakened lines- precut
11 lines- for ulterior separation by the user himself.

12 Examples of embodiments.

13 Example 1.

14 In this example, it is made use of a vertical machine, of
15 modified "fill-and-seal" type. The used aluminium foil is of
16 Reynolds brand, in tape of 35 mm width, and 300 metre long
17 rolls. Thickness is 28 micrometres for the face to be pierced
18 and 38 micrometres for the other one.

19 Before being slit into rolls of 35 mm width, said foil
20 has been coated on its full width -600 mm- with polypropylene
21 dispersion, and cured in a tunnel oven. The remaining
22 deposited thickness after cure is 6 micrometre.

23 When the two aluminium foils are face to face, their
24 mutual sealing is done along a rectangular periphery of 33 x

1 65 mm except on the upper side, through which an embossing
2 finger mechanically penetrates accompanied with a needle for
3 injection of the oxalate solution, then these two elements
4 withdraw, and the sealing is completed.

5 The oxalate solution consists of a dibutylphthalate
6 solvent in which, per litre, are dissolved 120 grams of CPP
7 oxalate and 1.5 gram of DPEA dye. These components are well-
8 known in the prior art in matter of chemiluminescent elements.

9 The ball is a bearing ball, of third choice, diameter 4.5
10 mm.

11 The films in the outer pouch are of copolymer
12 polypropylene-polyethylene without slip-agent in the formula,
13 thickness 0.25 mm, in rolls of 40 mm width, 300 m length.

14 The measured quantities of oxalate solution and activator
15 solution are respectively 1.7 and 0.7 millilitre.

16 Sealings are done by jaws or anvils having the shape of
17 rectangles with rounded corners, with an effective sealing
18 width of 2 mm. The thermal energy for the sealings is brought
19 either by electrical resistances or via an ultrasonic
20 generator.

21 The felt is a nonwoven "spunbond" film of polypropylene
22 and polyethylene fibers, of 120 grams per square metre.

23 The completed items, separated by an automatic temporized
24 knife, have a dimension of 45 x 70 mm and a weight of 4 grams.

1 Example 2.

2 The process is same as in Example 1, but with use of an
3 horizontal type machine. The embossing of the lower aluminium,
4 foil is done by lowering a punching tool prior to any sealing;
5 then the depositing of the liquid chemical is done with a
6 removable needle, thus the sealing between the two aluminium
7 foils is done in one shot along the whole periphery.

8 In this case the aluminium tapes feeding the machine have
9 a width of 41 mm, and those of flexible plastic film, a width
10 of 65 mm. Quantities of oxalate solution and activator
11 solution are respectively 2.2 and 1.1 millilitre. Completed
12 items have a diameter of 59 mm and a weight of 5 grams.

CLAIMS

1 1. Chemiluminescent lighting element, comprising at least
2 two chambers filled respectively with an oxalate solution and
3 an activator solution, characterized in that the oxalate
4 solution takes place in a tight-closed pouch, made of thin
5 aluminium foil, lined on its interior side by a polymer, said
6 pouch being a first chamber, being itself enclosed in a tight-
7 closed pouch, bigger, made of translucent polymeric film,
8 being a second chamber, containing also the liquid activator
9 solution.

1 2. Element according to claim 1 in which the polymer
2 lining the aluminium foil is a polyolefin.

1 3. Element according to claim 1 or 2 in which the outer
2 pouch consists of two polymeric films sealed together along
3 their periphery.

1 4. Element according to claim 3 in which one of the two
2 polymeric films is lined, on its internal side, by a felt or
3 fabric made of absorbing material and compatible with the
4 oxalate and activator solutions.

1 5. Element according to claim 3 in which the films are
2 under elastic tension.

1 6. Element according to claim 1, 2 or 3 in which the
2 outer pouch contains also one or several particles of hard
3 material.

1 7. Element according to claim 4 in which the particle of
2 hard material is a steel ball.

1 8. Element according to claim 4 in which the particle or
2 particles of hard material are polyolefin granulates.

1 9. Element according to anyone of the above claims in
2 which the inner pouch consists of aluminium foils lined of
3 polymer, and in which the sealing has areas of lesser
4 resistance to bursting.

1 10. Manufacturing process of a chemiluminescent lighting
2 element, according to anyone of claims 1 to 9, in which -
3 pouches made of thin aluminum foil lined with polymer are —
4 formed in a continuous and sequential way, by the unrolling of
5 two rolls of aluminium tape brought against each other,
6 polymer face in contact, and sealed at least along a

7 periphery, with injection of oxalate solution inside the
8 periphery delimited by the sealing,

9 -said pouches sealed and filled in that manner, are
10 separated by an automated knife and sent one by one, in a
11 sequential and temporized way, to a second machine which
12 incorporates them in a pouch of translucent plastic,

13 -said second machine doing the face-to-face positioning
14 of two tapes of flexible translucent polymer film, unrolled
15 from storage rolls, and sealed along periphery with insertion
16 of the aluminium pouch and of the activator solution inside
17 said periphery, the whole of which being done in a continuous
18 and temporized way,

19 -the final completed pouches being then either separated
20 from each other by means of an automated knife into series of
21 individual pouches, or supplied to end-user as a chain as gone
22 off from the machine.

1 11. Manufacturing process according to claim 10, in which
2 one of the two tapes of flexible translucent polymer film is
3 lined, on the face aimed towards the other polymer tape, by a
4 tape made of absorbing fiber felt, and is continuously sealed
5 to the nonlined flexible polymer film tape which faces it.

1 12. Manufacturing process according one of the claim 11

2 or 10, characterized in that, at that moment of inserting the
3 aluminium pouch and the activator solution, one or several
4 hard particles are also inserted between the two pouches.

5 The invention relates to a chemiluminescent light element
6 comprising two chambers, filled respectively with an oxalate
7 solution (5) and an activator solution. The oxalate solution
8 is a tight-sealed pouch (1) made of thin aluminum foil (2,3)
9 lined on its interior side by a polymer, for instance a
10 polyolefin, and so forms the first chamber. This latter is
11 enclosed in a bigger tight-sealed pouch (6) made of
12 translucent polymer film (7,8) forming the second chamber,
13 which also contains the liquid activator (10). The outer
14 pouch consists of two polymer films (7,8) sealed together
15 along their periphery and contain a ball (11) able to pierce
16 the inner pouch (1) by manual action from the user.