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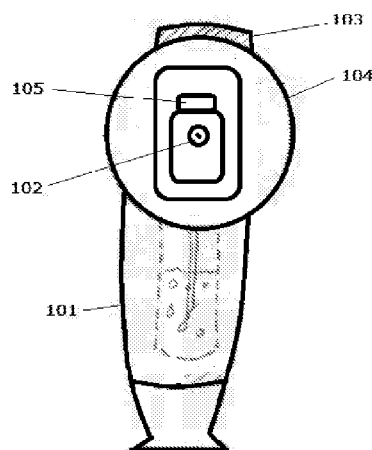


FIGURE 1

(57) Abstract: The present subject matter describes a transdermal spray device and a transdermal delivery system maintained by the device. The device comprises means (101, 102, 103) for storing and dispensing of a transdermal delivery system, and at least one UV light source (105) for initiating a curing procedure of the transdermal delivery system in relation to the dispensing action. The transdermal delivery system in turn comprises a drug or combination of drugs along with at least one UV curable monomer and a solvent system.



Transdermal delivery system and spray-device

Field of the Invention:

The invention generally relates to transdermal drug delivery system and devices therefor.

5 **Background of the Invention:**

Oral drug delivery is the most preferred route of delivery system having advantage of unit dosage form along with feasibility of dose titration. However, oral route has potential drawbacks including formulation of poorly soluble drugs, first-pass metabolism, patient compliance for paediatric and geriatric population, dose missing and at times intentional skipping of medications. This has led to exploration of other routes for drug delivery and transdermal route has emerged one of the promising approaches for drug delivery.

Transdermal drug delivery systems have the potential advantage of overcoming first-pass metabolism, systemic drug delivery, ease of formulation for poorly water soluble drug, dose reduction, ease of acceptance in paediatric and geriatric population and physical intervention/termination of medicament in between the treatment if required. With specific reference to immediate onset of action, transdermal spray delivery systems are widely being explored owing to the advantage of immediate action and its penetration to the subsequent skin layers. One of the prominent examples are the anti-inflammatory medicament sprays which provide quick relief from pain in conditions such as sports injury and muscle pull while executing daily activities.

The application of transdermal spray has been successfully adapted to delivery of therapeutic medicaments in conditions such as anti-psychotic and steroidal drugs. However, one of the potential problems associated with transdermal patches are the local irritation at the site of application. In addition, discomforts like erythema, itching, and local edema are frequently observed with these systems which are primarily caused by adhesive, polymers or other excipients used in patch formulation. Allergic reactions too are observed in few patients. Many patients feel the transdermal patches to be non-aesthetic in appeal.

Thus, there is a need to provide improved transdermal drug delivery system and devices therefor which addresses the aforesaid disadvantages.

30 **Summary of the Invention:**

This summary is provided to introduce a selection of concepts in a simplified format that are further described in the detailed description of the invention. This summary is not intended to identify key or essential inventive concepts of the claimed subject matter, nor is it intended for determining the scope of the claimed subject matter.

Accordingly, in accordance with the purposes of the invention, the present invention as embodied and broadly described herein provides a transdermal spray device and a transdermal delivery system maintained by the device. The device comprises means for storing and dispensing of a transdermal delivery system, and at least one UV light source for initiating a curing procedure of the transdermal delivery system in relation to the dispensing action. The transdermal delivery system in turn comprises a drug or combination of drugs along with at least one UV curable monomer and a solvent system.

To further clarify advantages and features of the present invention, a more particular description of the invention will be rendered by reference to specific embodiments thereof, which is illustrated in the appended drawings. It is appreciated that these drawings depict only typical embodiments of the invention and are therefore not to be considered limiting of its scope. The invention will be described and explained with additional specificity and detail with the accompanying drawings.

Brief Description of Figures:

These and other features, aspects, and advantages of the present invention will become better understood when the following detailed description is read with reference to the accompanying drawings in which like characters represent like parts throughout the drawings, wherein:

Figure 1 illustrates a front view of a device for storing and dispensing the transdermal delivery system in accordance with the teachings of the invention; and

Figure 2 illustrates a side view of the device shown in Figure 1.

Further, skilled artisans will appreciate that elements in the drawings are illustrated for simplicity and may not have been necessarily been drawn to scale. For example, in terms of the construction of the device, one or more components of the device may have been represented in the drawings by conventional symbols, and the drawings may show only those specific details that are pertinent to understanding the embodiments of the present invention so as not to obscure the drawings with details that will be readily apparent to those of ordinary skill in the art having benefit of the description herein.

Detailed Description:

For the purpose of promoting an understanding of the principles of the invention, reference will now be made to the embodiment illustrated in the drawings and specific language will be used to describe the same. It will nevertheless be understood that no limitation of the scope of the invention is thereby intended, such alterations and further modifications in the illustrated compositions and device, and such further applications of the

principles of the invention as illustrated therein being contemplated as would normally occur to one skilled in the art to which the invention relates.

It will be understood by those skilled in the art that the foregoing general description and the following detailed description are explanatory of the invention and are not intended

5 to be restrictive thereof.

Reference throughout this specification to “an aspect”, “another aspect” or similar language means that a particular feature, structure, or characteristic described in connection with the embodiment is included in at least one embodiment of the present invention. Thus, appearances of the phrase “in an embodiment”, “in another embodiment” and similar

10 language throughout this specification may, but do not necessarily, all refer to the same embodiment.

The terms “comprises”, “comprising”, or any other variations thereof, are intended to cover a non-exclusive inclusion, such that a process or method that comprises a list of steps does not include only those steps but may include other steps not expressly listed or inherent

15 to such process or method. Similarly, one or more devices or sub-systems or elements or substances or material or structures or components preceded by “comprises... a” does not, without more constraints, preclude the existence of other devices or other sub-systems or other elements or other substances or other materials or other structures or other components or additional devices or additional sub-systems or additional elements or additional

20 substances or additional materials or additional structures or additional components.

Through the whole document, the term “combination of” included in Markush type description means mixture or combination of one or more components, steps, operations and/or elements selected from a group consisting of components, steps, operation and/or elements described in Markush type and thereby means that the disclosure includes one or

25 more components, steps, operations and/or elements selected from the Markush group.

Unless otherwise defined, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. The system, methods, compositions and examples provided herein are illustrative only and not intended to be limiting.

30 The present invention provides a transdermal delivery system comprising of a drug or combination of drugs along with at least one UV curable monomer and a photoinitiator in a solvent system. The transdermal delivery system is deliverable from a transdermal spray device which has a UV light source coupled therewith. The actuation of the device sprays the transdermal delivery system on to skin which *in situ* and eventually gets cured after

exposure to UV light emitted by the device to form a thin, transparent and robust drug-polymer film on the skin which retains for prolonged period of time and provide sustained drug release. The novel transdermal spray device is coupled with UV light source which facilitates curing of sprayed monomer into a polymer having higher adhesiveness to the body surface.

The transdermal delivery system comprises drug or combination of drugs, UV curable monomer(s) and organic solvent(s). In addition, the transdermal delivery system may further comprise photoinitiators, plasticizers (or alternatively referred to as film forming agent), permeability enhancers, antioxidants, release retarding agent etc.

The drug can be selected from a group comprising of scopolamine, nitroglycerine, clonidine, isosorbide dinitrate, rivastigmine, rotigotine, propranolol hydrochloride, timolol maleate, clonazepam, verapamil, diclofenac sodium, naproxen sodium, ibuprofen, ketoprofen, indomethacin, piroxicam, ketorolac, tromethamine, nimesulide, hydrocortisone or esters thereof, dexamethasone, fluocinolone acetonide, betamethasone, estradiol, norethisterone, testosterone, progesterone, salbutamol, bambuterol, salmeterol xinafoate, fluticasone propionate, mometasone furoate, budesonide, beclomethasone dipropionate, sodium cromoglycate, isoprenaline sulphate; alendronic acid, pamidromic acid, etidronic acid, vasopressin, oxybutynin, imipramine, mitrazapine, desipramine, naratriptan, zolmitriptan, sumatriptan, nicotine, loperamide, misoprostol, hyoscyamine, atropine, trihexyphenidyl, lorazepam, diazepam, tiagabine, fluoxetine, paroxetine, lisinopril,trandolapril, captopril, amlodipine, felodipine, prazosin, amiloride, amphetamine, methamphetamine, methyphenidate, sibutramine hydrochloride, nafarelin, leuprolide acetate, insulin, growth hormone and analogues thereof, doxazosin, tamsulosin, terazosin, finasteride, alprostadil, sildenafil, bromocriptine, cabergoline, selegiline, melatonin, glimepiride, rosiglitazone, glyburide or glipizide; any of the chiral forms of the above drugs; pharmaceutically acceptable salts of any of the above; or any two or more of the above, including their chiral forms, in combination.

In a preferred aspect of the invention drug can be selected from a group comprising of Nicotine, amphetamine, methamphetamine, methyphenidate, scopolamine, isosorbide dinitrate, rivastigmine, rotigotine, estradiol, norethisterone, testosterone, progesterone, zolmitriptan, sumatriptan, loperamide, alprostadil, melatonin.

In an embodiment of the invention the UV curable monomer can be selected from a group comprising of acrylate derivatives which includes but not limited to N,N'-Methylenebis(acrylamide), acrylamide, 4-acetoxyphenethyl acrylate, acryloyl chloride, 2-

hydroxyethyl methacrylate, bis- glycidyl methacrylate, triethylene glycol monomethacrylate (TEGMA), urethane dimethacrylate (UDMA) etc.

In an embodiment of the invention the photoinitiator can be selected from a group comprising of camphorquinone, lucirin, Irgacure 651, Irgacure 184, Irgacure 2959, Irgacure 907 and Darocur MBF etc.

In an embodiment of the invention a ready-made mixed composition of acrylate based monomers and photoinitiators will be used. One of the example of such ready-made mixed composition is, but not limiting to, Heliaseal[®] F.

In an embodiment of the invention the plasticizers (or alternatively referred to as film forming agent) can be selected from a group comprising of Kollidone VA64, triethyl citrate, dimethyl isosorbide, acetyltributyl citrate, castor oil, propylene glycol, and polyethylene glycol or any other two or more of the above in combination.

In an embodiment of the invention the permeability enhancers can be selected from a group comprising of Octyl salicylate, dimethyl sulfoxide, dimethyl formamide, or isopropyl myristate, Tween 80, sodium lauryl sulfate, oleic acid, octyl dimethyl paraamino benzoic acid (Padimate O), polyhydric alcohol, propylene glycol, diethylene monoethyl ether EP (Transcutol) or any two or more of the above in combination.

In an embodiment of the invention the antioxidants can be selected from a group comprising of Vitamin E, propyl gallate, butylated hydroxyanisole, butylated hydroxytoluene, ascorbic acid, tocotrienols, carotenoids etc.

In an embodiment of the invention the release retarding agent can be selected from a group comprising of Eudragit RSPO, copolymer of methyl methacrylate and butyl methacrylate (Plastoid B[®]), a copolymer of dimethylamine ethyl methacrylate and a neutral methacrylic acid ester (Eudragit E 100[®]), ammonio methacrylate copolymer type B (Eudragit RS[®], USP/NF), ammonio methacrylate copolymer type A (Eudragit RL[®], USP/NF), methacrylic acid copolymer type A (Eudragit L100[®], USP/NF), methacrylic acid copolymer type B (Eudragit S100[®], USP/NF), polyvinyl acetate, cellulose acetate, polyvinyl alcohol, povidone vinyl acetate, hydroxyl propyl methyl cellulose, hydroxyl ethyl cellulose and methyl cellulose etc.

In an embodiment of the invention the solvent can be selected from a group comprising of ethanol, methanol, acetone, ethyl acetate, chloroform, dichloro methane or any other two or more of the above in combination.

In an embodiment of the invention, the transdermal delivery system comprises 1 to 30 %w/v of drug or combination of drugs.

In an embodiment of the invention, the transdermal delivery system comprises 1 to 20 %w/v of UV curable monomers.

In an embodiment of the invention, the transdermal delivery system comprises 1 to 10 %w/v of photoinitiator(s).

5 In an embodiment of the invention, the transdermal delivery system comprises 1 to 10 %w/v of plasticizers (or film forming agent).

In an embodiment of the invention, the transdermal delivery system comprises 1 to 8 %w/v of permeability enhancer.

10 In an embodiment of the invention, the transdermal delivery system comprises 0.1 to 3 %w/v of antioxidant(s).

In an embodiment of the invention, the transdermal delivery system comprises 1 to 10 %w/v of release retarding agent(s).

In an embodiment of the invention, a remaining portion of the transdermal delivery system is constituted by solvent.

15 In terms of the process of preparing the transdermal delivery system, the process comprises addition and solubilisation of the drug, the UV curable monomer and photo initiator, optionally other elements such as plasticizer, permeability enhancer, antioxidant, and release retarding agent in a sequential manner in the solvent with the aid of stirring. These ingredients are added in the weight percentage as mentioned above. The resulting
20 transdermal delivery system from such process is a clear solution. The final volume makeup of the transdermal delivery system is performed using the solvent.

The below examples provides details of the transdermal delivery system prepared using different combinations of drug, the UV curable monomer and photo initiator, optionally other elements such as plasticizer, permeability enhancer, antioxidant, and release
25 retarding agent in the solvent.

Example 1:

Ingredients	Quantity/batch (% w/v)
Rivastigmine	9%
Eudragit RSPO	3%
Kollidone VA64	2%
N,N'-Methylenebis(acrylamide)	5%
Camphorquinone	1%
Octyl salicylate	4%
Vitamin E	0.1%
Ethanol	q.s.

30 Example 2:

Ingredients	Quantity/batch (% w/v)
Rivastigmine	9%
Eudragit RSPO	3%
Kollidone VA64	2%
Acrylamide	5%
Lucirin	1%
Octyl salicylate	4%
Vitamin E	0.1%
Ethanol	q.s.

Example 3:

Ingredients	Quantity/batch (% w/v)
Rivastigmine	9%
Eudragit RSPO	3%
Kollidone VA64	2%
4-acetoxyphephenethyl acrylate	5%
Irgacure 651	1%
Octyl salicylate	4%
Vitamin E	0.1%
Ethanol	q.s.

5

Example 4:

Ingredients	Quantity/batch (% w/v)
Nicotine	9%
Eudragit RSPO	3%
Kollidone VA64	2%
N,N'-Methylenebis(acrylamide)	5%
Camphorquinone	1%
Octisalate	4%
Vitamin E	0.1%
Ethanol	q.s.

Example 5:

Ingredients	Quantity/batch (% w/v)
Nicotine	9%
Eudragit RSPO	3%
Kollidone VA64	2%
Acrylamide	5%
Lucirin	1%
Octisalate	4%
Vitamin E	0.1%
Ethanol	q.s.

10

Example 6:

Ingredients	Quantity/batch (% w/v)
Nicotine	9%
Eudragit RSPO	3%
Kollidone VA64	2%
4-acetoxyphephenethyl acrylate	5%
Irgacure 651	1%
Octisalate	4%
Vitamin E	0.1%
Ethanol	q.s.

While in the above paragraphs, the transdermal delivery system has been described in detail, in the following paragraphs, the transdermal spray device for storing and dispensing of the transdermal delivery system is described in detail with reference to figures 1 and 2. The transdermal spray device is illustrated in figures 1 and 2 as a hand-held dispensing device (100). The transdermal spray device (100) comprises means (101, 102, 103) for storing and dispensing of the transdermal delivery system. The transdermal delivery system comprises a drug or combination of drugs along with at least one UV curable monomer and a solvent system.

The means (101, 102, 103) is constituted by a hollow body (101) adapted to receive the transdermal delivery system, which may be in fluid state (including a viscous state). In an embodiment, the hollow body (101) may be adapted to receive a container including the transdermal delivery system.

Further, the means comprises a nozzle (102), which is in fluid flow communication with the transdermal delivery system, and a nozzle actuator mechanism (103), which upon actuation dispenses the transdermal delivery system via an outlet port of the nozzle (102). The nozzle (102) dispenses the transdermal delivery system in form of a spray. The nozzle (102) may be adapted to deliver a metered-quantity of the transdermal delivery system in response to actuation of the nozzle actuator mechanism (103).

The hollow body (101) may additionally define a wall (104) surrounding the nozzle (102). Further, the transdermal spray device (100) comprises one or more UV-light emitting sources (105), which may be placed on the wall (104) such that the UV-light emitting source (105) illuminates a space defined between the nozzle (102) and the wall (104). The hollow body may additionally include a UV-light source actuator mechanism (106). The wall (104) may additionally help in controlling a spray pattern (107) of the transdermal delivery system dispensed by the nozzle (102). Although not illustrated, the transdermal spray device (100) can be further provided with a closure cap detachably mountable on the wall (104).

In operation, the transdermal spray device upon receiving an actuation (i.e. user-actuation) through the nozzle actuator mechanism (103) dispenses the transdermal delivery system out of the hollow body (101) onto a target area. The UV light source (105) initiates a curing procedure of the dispensed transdermal delivery system through emission of a UV radiation. The emission of UV radiation may be triggered manually by a user through the actuator-mechanism (106). In other scenario, such emission may be automatically triggered. Nevertheless, whether automatic or manual, the emission of UV radiation is always in relation to the dispensing, since the emission of UV radiation is timed either alongside the dispensing or post elapse of a brief pre-determined time-interval after said dispensing. In other words, the dispensing and the emission of UV radiation depict different yet connected events of a same operation.

The transdermal delivery system as described above and the transdermal spray device allows for the realizing one or more of the following advantages.

Enhance therapeutic outcome & prolonged drug action: The dissolved form of the drug in the solvent systems facilitates the drug permeation through stratum corneum and further augment the permeability through deeper layers of skin. Unlike general topical sprays, in these systems, once the thin film of formulation is formed on skin and exposed to UV radiation, the *in silico* polymerization process occurs eventually which helps entrapment the drug in the cured polymeric layer. This scenario confers an additional release retardant effect and may even enhance this effect along with other release retardant polymers. This effect would help govern the release profile of the drug for desired duration which would not be practically possible with general topical sprays. The system, in addition would provide robustness and skin adhesive capability to bestow therapeutic action for longer duration.

Prevents skin irritation: The topical spray is non-occlusive and helps reduce the problem of skin irritation associated with transdermal patches.

Enhance patient's compliance: The product eliminates the need of repeated use which offers a patient convenient dosage regimen.

Dose flexibility: Installation of metered dose dispensing accessories in the spray device will help facilitate dispensing of desired dose of formulation on to the skin as per patients requirement.

Aesthetic appeal: In addition, the transparent layer enhances the aesthetic appeal of the system compared to transdermal patches.

While specific language has been used to describe the disclosure, any limitations arising on account of the same are not intended. As would be apparent to a person in the art, various working modifications may be made to the disclosure in order to implement the inventive concept as taught herein.

5 The figures and the forgoing description give examples of embodiments. Those skilled in the art will appreciate that one or more of the described elements may well be combined into a single functional element. Alternatively, certain elements may be split into multiple functional elements. Elements from one embodiment may be added to another embodiment. For example, orders of processes described herein may be changed and are not
10 limited to the manner described herein. The scope of embodiments is by no means limited by these specific examples. Numerous variations, whether explicitly given in the specification or not, such as differences in structure, dimension, and use of material, are possible.

CLAIMS:

1. A transdermal spray device comprising:
means (101, 102, 103) for storing and dispensing of a transdermal delivery
5 system, the transdermal delivery system comprising a drug or combination of drugs
along with at least one UV curable monomer and a solvent system; and
at least one UV light source (105) for initiating a curing procedure of the
transdermal delivery system in relation to the dispensing action.
- 10 2. The transdermal spray device as claimed in claim 1, wherein the means (101, 102,
103) for storing and dispensing of the transdermal delivery system comprises:
a hollow body (101) adapted to receive the transdermal delivery system in a fluid
state;
a nozzle (102) which is in fluid flow communication with the transdermal
15 delivery system; and
a nozzle actuator mechanism (103), which upon actuation dispenses the
transdermal delivery system in form of a spray via an outlet port of the nozzle (102).
3. The transdermal spray device as claimed in claim 2, wherein the hollow body (101)
20 is adapted to receive a container including the transdermal delivery system in a fluid
state.
4. The transdermal spray device as claimed in claim 2, wherein the nozzle (102) is
adapted to deliver a metered quantity of the transdermal delivery system in response
25 to actuation of the nozzle actuator mechanism (103).
5. The transdermal spray device as claimed in claim 2, wherein the hollow body (101)
defines a wall (104) surrounding the nozzle (102).
- 30 6. The transdermal spray device as claimed in claim 5, wherein the at least one UV
light source (105) is mounted on the wall (104) and is adapted to illuminate a space
defined between the nozzle (102) and the wall (104).
7. The transdermal spray device as claimed in claim 6, further comprising a closure cap
35 detachably mountable on the wall (104).

8. The transdermal spray device as claimed in claim 2, wherein the hollow body (101) includes a UV-light source actuator mechanism (106).
9. The transdermal spray device as claimed in claim 1, wherein the said device is in the
5 form of a hand-held dispensing device (100).
10. A transdermal delivery system comprising a drug or combination of drugs along with at least one UV curable monomer and a solvent system.
- 10 11. The transdermal delivery system as claimed in claim 10, wherein the drug comprises scopolamine, nitroglycerine, clonidine, isosorbide dinitrate, rivastigmine, rotigotine, propranolol hydrochloride, timolol maleate, clonazepam, verapamil, diclofenac sodium, naproxen sodium, ibuprofen, ketoprofen, indomethacin, piroxicam, ketorolac, tromethamine, nimesulide, hydrocortisone or esters thereof,
15 dexamethasone, fluocinolone acetonide, betamethasone, estradiol, norethisterone, testosterone, progesterone, salbutamol, bambuterol, salmeterol xinafoate, fluticasone propionate, mometasone furoate, budesonide, beclomethasone dipropionate, sodium cromoglycate, isoprenaline sulphate; alendronic acid, pamidromic acid, etidronic acid, vasopressin, oxybutynin, imipramine, mitrazapine, desipramine, naratriptan,
20 zolmitriptan, sumatriptan, nicotine, loperamide, misoprostol, hyoscyamine, atropine, trihexyphenidyl, lorazepam, diazepam, tiagabine, fluoxetine, paroxetine, lisinopril,trandolapril, captopril, amlodipine, felodipine, prazosin, amiloride, amphetamine, methamphetamine, methyphenidate, sibutramine hydrochloride, nafarelin, leuprolide acetate, insulin, growth hormone and analogues thereof, doxazosin, tamsulosin,
25 terazosin, finasteride, alprostadil, sildenafil, bromocriptine, cabergoline, selegiline, melatonin, glimepiride, rosiglitazone, glyburide or glipizide.
12. The transdermal delivery system as claimed in claim 10 or 11, wherein the drug comprises nicotine, amphetamine, methamphetamine, methyphenidate, scopolamine,
30 isosorbide dinitrate, rivastigmine, rotigotine, estradiol, norethisterone, testosterone, progesterone, zolmitriptan, sumatriptan, loperamide, alprostadil and melatonin.
13. The transdermal delivery system as claimed in claim 10, wherein the UV curable monomer comprises acrylate derivatives which includes but not limited to N,N'-
35 Methylenebis(acrylamide), acrylamide, 4-acetoxypheethyl acrylate, acryloyl

chloride, 2-hydroxyethyl methacrylate, bis- glycidyl methacrylate, triethylene glycol monomethacrylate (TEGMA), urethane dimethacrylate (UDMA).

14. The transdermal delivery system as claimed in claim 10, wherein the solvent system
5 comprises ethanol, methanol, acetone, ethyl acetate, chloroform, dichloro methane or two or more of the above in combination.

15. The transdermal delivery system as claimed in claim 10, further comprises at least
10 one of photoinitiator(s), plasticizer(s), permeability enhancer(s), antioxidant(s) and release retarding agent(s).

16. The transdermal delivery system as claimed in claim 15, wherein the photoinitiator
comprises camphorquinone, lucirin, Irgacure 651, Irgacure 184, Irgacure 2959, Irgacure 907 and Darocur MBF etc.

17. The transdermal delivery system as claimed in claim 15, wherein the plasticizer
comprises Kollidone VA64, triethyl citrate, dimethyl isosorbide, acetyltributyl citrate, castor oil, propylene glycol, and polyethylene glycol or any combination thereof.

18. The transdermal delivery system as claimed in claim 15, wherein the permeability
enhancer comprises Octyl salicylate, dimethyl sulfoxide, dimethyl formamide, isopropyl myristate, Tween 80, sodium lauryl sulfate, oleic acid, octyl dimethyl
20 paraamino benzoic acid (Padimate O), polyhydric alcohol, propylene glycol, diethylene monoethyl ether EP (Transcutol) or any combination thereof.

19. The transdermal delivery system as claimed in claim 15, wherein the release
retarding agent comprises Eudragit RSPO, copolymer of methyl methacrylate and butyl methacrylate (Plastoid B®), a copolymer of dimethylamine ethyl methacrylate
30 and a neutral methacrylic acid ester (Eudragit E 100®), ammonio methacrylate copolymer type B (Eudragit RS®, USP/NF), ammonio methacrylate copolymer type A (Eudragit RL®, USP/NF), methacrylic acid copolymer type A (Eudragit L100®, USP/NF), methacrylic acid copolymer type B (Eudragit S100®, USP/NF), polyvinyl acetate, cellulose acetate, polyvinyl alcohol, povidone vinyl acetate, hydroxyl propyl
35 methyl cellulose, hydroxyl ethyl cellulose and methyl cellulose.

20. The transdermal delivery system as claimed in claim 15, wherein the antioxidant comprises Vitamin E, propyl gallate, butylated hydroxyanisole, butylated hydroxytoluene, ascorbic acid, tocotrienols and carotenoids.
- 5 21. The transdermal delivery system as claimed in claim 15, wherein the UV curable monomer and the photoinitiator is a ready-made mixed composition of acrylate based monomers and photoinitiators.
22. The transdermal delivery system as claimed in claim 10, comprising 1 to 30 %w/v of
10 drug or combination of drugs.
23. The transdermal delivery system as claimed in claim 10, comprising 1 to 20 %w/v of UV curable monomers.
- 15 24. The transdermal delivery system as claimed in claim 15, comprising 1 to 10 %w/v of photoinitiator(s).
25. The transdermal delivery system as claimed in claim 15, comprising 1 to 10 %w/v of plasticizer(s).
- 20 26. The transdermal delivery system as claimed in claim 15, comprising 1 to 8 %w/v of permeability enhancer(s).
27. The transdermal delivery system as claimed in claim 15, comprising 0.1 to 3 %w/v
25 of antioxidant(s).
28. The transdermal delivery system as claimed in claim 15, comprising 1 to 10% w/v of release retarding agent(s).
- 30 29. The transdermal delivery system as claimed in claim 15, comprising 1 to 30 %w/v of drug or combination of drugs, 1 to 20 %w/v of UV curable monomers, 1 to 10 %w/v of photoinitiator(s), 1 to 10 %w/v of plasticizer(s), 1 to 8 %w/v of permeability enhancer(s), 0.1 to 3 %w/v of antioxidant(s), 1 to 10% w/v of release retarding agent(s) and a remaining portion of the transdermal delivery system is constituted by
35 solvent.

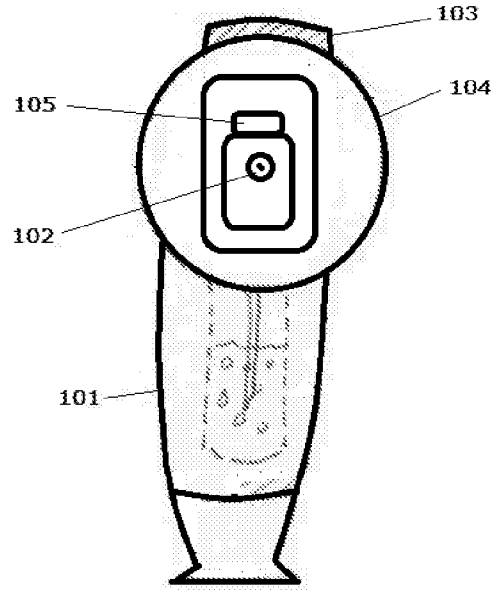


FIGURE 1

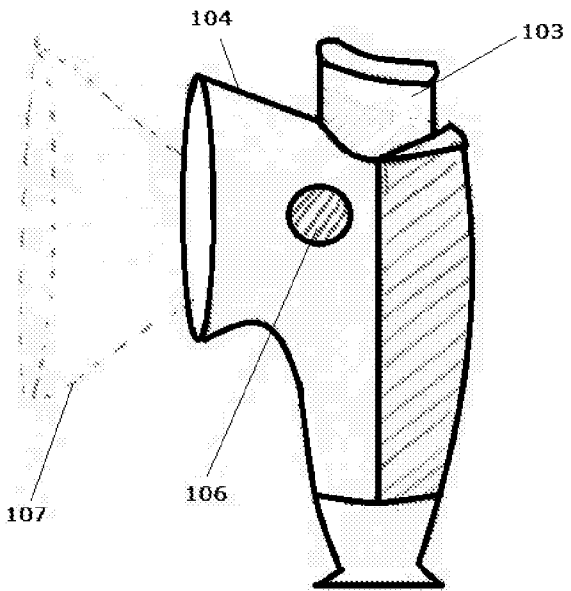


FIGURE 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/IN17/50519

A. CLASSIFICATION OF SUBJECT MATTER

IPC - A61K 9/08, 9/10; A61M 11/00; A61L 26/00 (2018.01)

CPC - A61K 9/0014, 9/7015, 9/7023; A61M 11/006, 35/003; A61L 26/0009, 26/0066, 26/0076, 26/008

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

See Search History document

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

See Search History document

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

See Search History document

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X -- Y	US 2002/0122771 A1 (HOLLAND, T et al.) 05 September 2002; abstract; paragraphs [0010], [0017], [0020], [0027], [0029], [0037], [0045], [0050], [0062], [0065], [0074], [0078], [0087]-[0088], [0095]-[0096], [0111]; tables 1, 6; claim 1	10, 13-16, 19-23, 27-28 ----- 1-9, 11, 12/10-11, 17-18, 24-26, 29
Y	US 2009/0194474 A1 (TRANCHANT, JF et al.) 06 August 2009; abstract; figures 1-2; paragraphs [0003], [0007], [0025], [0035]-[0036], [0039]-[0040], [0042], [0044], [0050]	1-9
Y	US 2013/0032610 A1 (MULLER, P) 07 February 2013; abstract; paragraphs [0023], [0027]	7
Y	US 6,723,077 B2 (PICKUP, RL et al.) 20 April 2004; column 3, lines 35-49	11, 12/10-11
Y	US 2016/0067252 A1 (STRATEGIC SCIENCE & TECHNOLOGIES, LLC) 10 March 2016; abstract; paragraph [0009]; claim 1	17-18, 25-26, 29
Y	US 2015/0250922 A1 (COLE, M et al.) 10 September 2015; abstract; paragraphs [0051], [0053]	24, 29
A	US 2009/0145452 A1 (ANDERSON, DG et al.) 11 June 2009; entire document	1-29
A	US 2015/0209808 A1 (THE PROCTER & GAMBLE COMPANY) 30 July 2015; entire document	1-29
A	US 6,958,154 B2 (ANDOI INO BRANDT, P.I et al.) 25 October 2005; entire document	1-29

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

13 March 2018 (13.03.2018)

Date of mailing of the international search report

28 MAR 2018

Name and mailing address of the ISA/

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