2019 IPIC PATENT AGENT TRAINING COURSE
DRAFTING & PROSECUTION
SAMPLE ANSWER - EXERCISE #3

This is a difficult exercise, particularly if it were to be presented in the Patent Agent Exam. The prosecution exam is typically set and marked by CIPO Examiners. Candidates should try to avoid responding in a manner that takes the position that the Examiner is wrong. Generally, one should look carefully for information in the exam materials to support an amendment that will avoid the objections. However, as will be outlined below, the present fact situation does not offer much opportunity to respond in a way that does not require a challenge to the Examiner's opinion concerning obviousness of the previously claimed subject matter.

After reading the materials, one may wonder why the Examiner did not raise a novelty objection to the first claim based on Johnston. Claim 1 encompasses injection of liquids and col.1, lines 6-12 of Johnston refers to introduction of dosages of liquid medicament into "the stalk or other surface of a plant".

You may be interested to know that Simmons is a U.S. patent attorney. His patent might have been pursued as being a humorous "vanity" publication. Unfortunately for this Applicant, Simmons was quite thorough in describing his experiments firing shotguns at trees.

This appears to be a situation where the Applicant was confident that use of needleless injectors on plants was novel. Little thought seems to have been given during the drafting process to the possibility that prior art may be discovered which negates the novelty of this concept. There is very little in the way of descriptive support and examples for a "fall-back" position.

I would have preferred to see more descriptive support regarding "controlled release", as well as a range of suitable viscosities and an actual example of particle delivery. I would also be curious to know whether the invention will work with only solid particles or whether particles must be dispersed in a fluid media.

Not only would further description provide support for amended claims, it may also have allowed an argument based on unpredictability. It is difficult to argue that one would not know from the prior art whether an invention will work if there are no examples showing that it does.

There is an example of delivery of a viscous liquid (Example 1). There is no reference to viscous liquids in the prior art but the descriptive information in the application gives little room to manoeuvre in this area if the Examiner requires the claim to include viscosity limitations. There is only one viscosity value set out in the description, which is the viscosity of the specific solution used in Example 1.

There are no actual examples of the delivery of particles but the original claims give some parameters that could be used to define the scope of claims relating to the delivery of particles or pellets. It should also be noted that the diameter ranges set out in the original claims are not found in the description and one should also consider amending the description to include those diameters.

Example 2 discloses delivery of a solution. This appears to be exactly what is suggested in the "Background" section of Johnston.

Although the Examiner raises two separate obviousness objections, one should try to keep totality of what is disclosed in the cited references in mind when devising a response. Ideally, any argument should take into consideration the possibility that the Examiner could combine the teachings of Simmons and Johnston.

In real life, one would not proceed without discussing the situation with the Applicant or in this case, the Applicant's foreign representative. However, on the exam, one can only make use of the written information provided in the materials and a dictionary. Of course, any amendment must be supported by the application, just as would be the case in real life.

Page 3 of the description (see lines 9-18) suggests advantages of minimizing leakage of an injected medium and/or injection into unlignified plants or parts of plants. One may wonder whether the "controlled release" referred to in the claims has something to do with minimizing leakage. However, the terminology employed is not the same and there is specific reference to "controlled active substance release" in the first paragraph at page 6 of the description. At least for purposes of the exam, I would rely on the latter paragraph as explaining the nature of "controlled release". That paragraph points out that "controlled release" is possible with the use of viscous liquids or formulations that contain particles. Neither Johnston nor Simmons mentions anything about "release" characteristics of material to be delivered to plants, although one may argue that release over time is implicit in delivery of solid fertilizer as disclosed in Simmons. Amer et al. does discuss controlled release but a careful reading of this document shows that it does not specifically refer to injection of particles into plants. While there is

mention of parenteral delivery into "human or animals", this document teaches delivery to plants using a "pollination-like system" (col. 10, lines 39-52).

The present application also contains an explanation regarding how a non-lignified plant can function to reduce leakage after delivery of a liquid using the needleless injector (see col. 4, lines 13-16). However, to only claim injection into non-lignified plants could severely restrict the scope of the claims. Also, there is the question of how easily the claims could be enforced (and against whom) if they leave open freedom to inject lignified plants. Another reason to not choose to limit the claims in this manner is that Johnston teaches injection of liquids into a "stalk" of a plant. Some dictionaries will indicate that a stalk is a part of a herbaceous plant. Herbaceous plants are not lignified.

The application also mentions varying injection depth by varying angle and distance of the device to the surface to be injected (see page 4, lines 6-8). It should be noted that Simmons mentions varying the distance to control penetration (col. 3, line 29-32). While the device claimed in Johnston would not be suitable for such a purpose, one should not assume that needless injectors in general have to be pressed against the skin of a recipient. Therefore, this seems to be an unlikely basis in which to distinguish the present invention. Furthermore, introducing such a limitation into "use" claims is awkward.

Taking everything into consideration above, I think that this is a case where one should try to devise an argument against the Examiner's general conclusion that all of the claims are obvious.

To keep things simple on the exam, you could amend claim 1 as shown on attachment "A" and use arguments similar to those set out in the attached sample response regarding how the cited references do not suggest particles in the recited diameter range. Another option is to limit the claims to viscous fluids. The latter option has the advantage of there being an example in the application showing that it works but a disadvantage in terms of support for what "viscous" means if the Examiner should object further. However, no objections regarding sufficient support or utility were made in the Examiner's Report and need not be addressed on the exam.

The sample response set out below is an effort to cover use of viscous formulations as well as formulations containing particles. The attached sample answer is based on amending claim 1 as shown in Appendix "B".

I do not recommend amending the claims as suggested by the Examiner to recite "plants". This would unduly limit the claims given that there is clear support for injection of such formulations into wood. The specification contains support for "plant material" at page 4, line 19 and I recommend using that term and to add dependent claims that will assist in construction of the broad claim as including living plants and wood.

Please note that I have amended claim 1 to refer to "a flowable solid, etc.," simply because I was concerned that the invention would not work with a complete solid. There is support for "flowable" in the application at page 4, line 18. This claim would still potentially encompass a collection of fine particles, not suspended in a liquid (hence my comment above as to whether such an embodiment would work).

I did not include claims other than ones based on the original "use" claims. However, in real life, I would consider alternate claim formats. Method claims could be employed. CIPO will not object since the objection to be treated is not a human or an animal. Method claims could also include a step of varying distance and angle, if desired. Perhaps more important would be to consider addition of product claims that may be more easily enforced against a manufacturer. In this regard, one could consider including claims based on the following.

> A controlled release formulation for use in a needle-free pressure-actuated injection device for administration to plant material, the formulation containing particles comprising an active agent that is a systemically active plant protection agent, a plant restorative, a growth regulator, a fertilizer, or a wood treatment agent, wherein said particles have a diameter of 0.1 to 5.0 μm.

It is a good idea to format the response in a manner that demonstrates you have knowledge of the *Patent Rules* pertaining to communications with the Commissioner. You should consider the requirements of *Patent Rules* 5(1), 7 and 34. If you wish, you could include a complete address for the Commissioner (e.g., see Patent Notice entitled "Updated Correspondence Procedures" dated July 17, 2007). You could also follow the suggested template for amendments outlined in Section 19.02.04 of MOPOP. At the very least, the letter should indicate that it is a response to the particular Official Action referenced by date and refer to enclosing replacement pages and the explanation required by *Rule* 34.

If you prepare a U.S. style amendment, your letter should indicate that it is intended to be a guide to the amendments and your letter should also indicate that replacement pages are enclosed.

As for the title, please be aware of the Commissioner's Notice dated January 27, 2009, and file a replacement page of the description containing the amended title. I also recommend that you specifically ask the Examiner to enter the amended title in CIPO's records.

Finally, don't forget a response to the *Rule* 29 requisition or the application will be deemed abandoned.

Chris Robinson

(A)

CLAIMS

1. Use of needle-free pressure-actuated injection device as known in human and veterinary medicine for diagnostic or therapeutic purposes, for injecting a formulation ~~which is in solid, semi-solid or liquid form~~ for controlled release of a substance belonging to the group of systemically active plant protection agents, plant restoratives, growth regulators, fertilizers, and preparations for wood treatment,

2. ~~The use according to the above claim~~, wherein the substance is present in pellets having a diameter of 0.1 to 5.0 µm, ~~preferably 0.2 to 1.0 µm.~~

3. ~~Use of needle-free pressure-actuated injection devices of general construction, substantially as described herein.~~

(B)

CLAIMS

1. Use of a needle-free pressure-actuated injection device as known in human and veterinary medicine ~~for diagnostic or therapeutic purposes~~, for injecting a formulation into plant material which is in a flowable solid, semi-solid or viscous liquid form ~~for controlled release of a substance belonging to the group of systemically active plant protection agents, plant restoratives, growth regulators, fertilizers, and preparations for wood treatment~~, providing that when the formulation contains solids, the solids are particles.

~~2. The use according to the above claim, wherein the substance is present in pellets having a diameter of 0.1 to 5.0 µm, preferably 0.2 to 1.0 µm.~~

~~3. Use of needle-free pressure-actuated injection devices of general construction, substantially as described herein.~~

July xx, 20xx

The Commissioner of Patents
Ottawa-Gatineau, Canada
K1A 0C9

RESPONSE TO EXAMINER'S REPORT

Dear Commissioner:

RE: Canadian Patent Application No. 2,xxx,xx1
Owner: Owner
Title: INJECTION APPARATUS

This letter is filed in response to the Examiner's Report dated May xx, 20xx. Please make the following changes.

In the Abstract:

Replace the abstract presently on file with the enclosed abstract on a single page.

In the Description:

Replace pages 1, 3, 4, and 6 presently on file with the enclosed like-numbered pages.

In the Claims:

Replace the claims presently on file with enclosed page 7. After this amendment, the application will contain 10 claims.

Remarks

The abstract has been amended to conform to the requirements of *Rule* 79, as requested by the Examiner.

The description has been amended by deleting the statement that incorporates other documents by reference and by identifying trademarks, as requested by the Examiner. In addition, the title has been amended to more precisely define the invention, as requested by the Examiner. Please enter the following amended title in the records of CIPO.

USE OF NEEDLE-FREE INJECTION DEVICES FOR
ADMINISTRATION OF CONTROLLED RELEASE
FORMULATIONS TO PLANT MATERIAL

The reference to claim numbers in the description has been deleted as being unnecessary. The description has also been amended at the same location to include statements reciting the limitations and features of the original claims as well as those of the enclosed claims.

Claim 1 has been amended by removing unnecessary statements regarding "known" aspects of the injection device. The claim has also been amended by removing reference to the nature of the active agent contained in the formulation, as this invention is clearly not limited to the use of any particular agent. However, the claim continues to specify "controlled release".

Claim 1 has also been amended so that the formulation is now recited as being in "a flowable solid, semi-solid or viscous liquid form". Support is found throughout the description, for example, at page 4, lines 17-20 as originally filed.

Claim 1 has also been amended to provide that when the formulation contains solids, the solids are present as particles having a diameter of 0.1 to 5.0 μm. Support is found in original claim 2 and in the description (for example, in the first paragraph of page 6 as originally filed).

Finally, claim 1 has been amended to make it clear that the use of the device is for injection of the formulation into "plant material". This is supported from the entirety of the description where it is clear that this invention may involve injection into both plants as well as the wood in wooden articles such as lumber (for example, see original page 5, lines 16 to 26).

The alternate limitation in original claim 2 is now recited in enclosed claim 3, the dependency of which conforms to the requirements of *Rule* 87(1).

Original claim 3 has been deleted.

Enclosed dependent claims 2 and 4-10 are new and recite features of particular embodiments of this invention pertaining to presence of particles in the formulation, use of agents that are active on living plants, use of wood protection agents, injection into living plants, injection into wood, and viscous liquid formulations. Support can be found in the description as discussed above, as well as in page 3 (lines 17-19); page 4 (lines 13-16 and 28-30); and in the Examples as originally filed.

We believe that the claim amendments will avoid all of the Examiner's objections under subsection 27(4) of the *Act* and *Rule* 87(1). The Examiner is respectfully requested to reconsider the objection that the invention is obvious from the cited references, in view of the claim amendments and the following comments.

Firstly, we wish to address the Examiner's characterisation of the references. The Examiner is of the opinion that "Simmons discloses a needle-free pressure-actuated injection device for plants". However, what Simmons discloses is use of a shotgun for forcibly penetrating liquid ink and/or solid fertilizer into trees. This application makes it clear that a device for use in the present invention is considerably different from a shotgun and we submit that the present claims are not to be read in isolation but with a view to how those claims would be understood by the skilled reader of the entire document. We rely on the prior art referenced in the present application which describes such devices known for use in diagnostic and therapeutic purposes in human and veterinary medicine. Furthermore, the present application at enclosed page 4, line 11 makes it clear that the device for use in this invention has a nozzle. A shotgun has a barrel which permits passage of a large quantity of solid shot, not a nozzle that functions in the manner of the needle-free claims used in the present invention. Further information concerning the nature of such a nozzle used in the needle-free injection devices contemplated by the present application is found in the description in the Johnston patent cited by the Examiner herein.

Simmons uses a shotgun to deliver a liquid or solid charge with sufficient force to penetrate the bark of a woody plant such as an elm tree. The solid charge is either a solid "slug" or consists of "particles of solid material fine enough to penetrate, depending on the circumstances, without causing undue damage to either the interior or the exterior of the plant to be treated" (col. 3, lines 47-57). However, it must be borne in mind that the particles used by Simmons are loaded into a

shotgun shell or other firearm cartridge (e.g., see col. 2, line 28 to col. 3, line 10). Such particles are much larger than the particles used in the present invention and there is no reason to assume that they could possibly function in a typical needleless injection device. For example, see col. 2, line 47 and col. 3, line 5 of Simmons, which describe the use of solid particles of fertilizer of "10 mesh (sieve opening about 0.09 inch)". There is no disclosure of delivery of viscous liquids or semi-solids in Simmons nor any mention of release of material with which the plants were impregnated.

The Examiner characterises Amer et al. as describing administration of "controlled-released active substance preparations to plants by injecting particulate active substance carriers in the form of microbeads". However, while Amer et al. does disclose particulate, controlled-release carriers, there is no discussion of administration of such carriers by injection, except into animals. Plants are mentioned throughout Amer et al. because the particles are derived from plant pollen. However, Amer et al. clearly states that the method for delivery to plants is "by a pollination-like system" (col. 10, lines 49 and 50). Pollination does not involve injection. Pollen is simply dispersed in the air. Also, the size of the particles in Amer et al. is much larger than the particle sizes recited in the enclosed claims. The examples in Amer et al. show that the basic pollen grain has an aerodynamic diameter of about 24-26 microns (see col. 12, lines 38-41). The modified pollen grains comprise additional layers, each of which may be 3 to 5 μm (see col. 12, lines 10-28). There is no indication in Amer et al. that the modified pollen grains could be delivered by some form of needleless injection device such as is used in the present invention.

The Examiner characterises Johnston as having to do with the field of pressure injectors for introduction of liquid medicaments into the stalk of a plant. The Examiner concludes that "it is therefore known in the art to use needle-free pressure-actuated injection devices for the administration of bioactive substances to plants". Despite this finding, the Examiner did not cite Johnston et al. as anticipating any of the claims. We believe that this is noteworthy for two reasons. The first is that Johnston et al. does not disclose nor suggest injection of any controlled release formulation. Second, Johnston could only qualify as "enabling" for plant treatment to a very limited extent, if at all.

The only mention of plants in Johnston is in the Abstract and at col. 1, lines 6-12 with regard to the field of that invention and such reference is limited to liquids. Very little can be taken from Johnston regarding plants, particularly since Johnston's device could not be used for administration to a plant. Johnston's invention makes it clear that it will only work when the skin of a subject against which its nozzles are directed is "sufficiently indented by nozzle 13 that the skin rolls or folds into contact with the mouth 59 surrounding the nozzle 13 that a seal of the mouth may be effected" (col. 5, lines 35-39). The presence of skin that rolls or folds is necessary because the mouth of each nozzle must be simultaneously sealed in order for "trigger air" to sufficiently build up to fire the device (e.g., see col. 5, lines 13-27).

For the reasons discussed above, we believe that the reader would have derived very little, if anything at all, from the totality of the cited art for plant treatment, except for use of a shotgun to impregnate a tree with a liquid or large particles. Also, the reader would learn nothing whatsoever regarding administration of controlled release formulations nor injection into non-woody plants.

As is set forth in the present application (e.g., see original page 4, lines 17-22), this invention provides the means for administration of controlled release formulations containing particulate solids or viscous liquids to plant material. This invention also allows for delivery to both lignified and unlignified plants as well as wood. There is no information in any of the cited references directing the unimaginative person of skill in the art to deliver such formulations to any plant material using a needleless injector.

Rule 29

In response to the Examiner's requisition under *Rule* 29, we enclose copies of the cover page of United States Patent No. 8,xxx,xxx which issued from a corresponding U.S. application. This document lists the references cited or otherwise made of record by the Applicant. We also enclose the Search Report from the priority application which was published as EPxxx,xxx.

Yours very truly,

PATENT AGENT

ABSTRACT

Needle-free injection devices are disclosed for use in injecting controlled release formulations into plant material. The formulation is in the form of a flowable solid, semi-solid or viscous liquid. When the formulation contains solids, the solids are present as particles having a diameter of 0.1 to 5.0 μm. The plant material may be that of a living plant or wood. The formulation may comprise an active agent selected from the group consisting of systemically active plant protective agents, plant restoratives, growth regulators, and fertilizers or the formulation may comprise a wood treatment agent.

~~INJECTION APPARATUS~~ <New Title>

SPECIFICATION

The present invention relates to the use of pressure-actuated injection devices without a needle for the administration of active substances to plants.

The injection as a form of administering active substances to plants has been known for long. It is superior to the usual application methods, such as spattering and spraying, because there is no spray drift and environmental pollution.

In the meantime a lot of injection devices have been developed to optimize the injection methods in plants, in particular in plants having lignified trunks. The so-called "Mauget-System" is to be mentioned first as one of the widely used injection systems; it is described, for example, in the patents US 3 304 655 and US 4 365 440. Although the construction of the devices described in these patents differ in details, both operate according to the same principle. They relate to a non-refillable injector for the single dosage (disposable injector) consisting of a container filled with the liquid to be injected and a feed pipe to be inserted into the trunk. The container is composed of two bowls which are telescoped by means of a groove and tongue system. When the two components are pressed together, the pressure of the gas phase above the liquid is increased. The medium to be injected is then pressed through the feed pipe into the trunk of the plant. However, the use of these injection devices in horticulture has already shown deficiencies: the liquid injection by means of these systems always involves the risk of an active substance loss (liquid leakage from the bore aperture in the trunk) on the one hand, and this injection method is time-consuming and requires heavy application technological expenditure on the other hand.

A useful alternative is the high-pressure injector developed in the USA in the seventies. An example relating to this injection device is the patent US 4 011 685. The main advantage of this device is the minimized risk of liquid leakage obtained by installing a pumping device and a so-called self-closing needle. When this injection device is used, lignin fibres of the tissue cells near the needle rapidly contract because of the high pressure used (up to 350 bar) and therefore the previously formed cavity is sealed up, preventing possible emergence of active substance. This injection: system is suitable for repeated application to inject liquids of various viscosities. However, the disadvantage lies in the fact that an accommodation space must generally be pre-drilled into the plant trunk when this system is used. Moreover, it is possible

medium already injected cannot flow back, or it flows back to a minor degree.

Finally, the injection device described in U.S. 4 164 093 is a mini pressure-injector for the use in small-diameter plant sprouts, for example in seedlings, tree branches, or young plants. The device comprises a syringe (according to the construction of a commercial subcutaneous syringe with single-use needle) and a commonly used multipurpose gardening tongs, the syringe being rigidly fastened at the stationary jaw. The free adjustability of the jaw width permits the mini-injector to be positioned at optional sites at the shoot axis and ensures flexible handling of the total device in dependence on the kind of plant used.

None of the injection devices known from the art for the use in plants succeeded in solving the problem of leakage of the injected medium in a perfect and satisfactory way. Moreover, most of the above-mentioned injection systems require a relatively heavy investment with respect to equipment and time. In addition, these devices are only suitable for injecting liquid media.

Since none of the publications mentioned so far, gives an indication as to using injection devices in plants which are not lignified, one may assume that they are not suitable for such an application.

It is an object of the present invention to provide an injection method by which both solid and liquid media can be injected, in the last-mentioned case avoiding the disadvantage of leakage, particularly in plants having unlignified shoot axes.

Most surprisingly, it has been found that needle-free injection devices without needles and actuated by pressure ~~according to the characterizing features of the main claim 1 and those of subclaims 2 to 5 fully meets this requirement.~~ such as those known in human and veterinary medicine for diagnostic or therapeutic purposes can be used for injecting controlled release formulations into plant material. Thus, the present invention provides <repeat claim 1>.

The present invention will be described in greater detail in the following description.

Pressure-actuated injection devices without a needle have been known in human and veterinary medicine for some time. For several years now, they have been used for diagnostic and therapeutic purposes where painless injection or puncture is required. They are commercially available under various names (for example, the vaccination syringe manufactured in the former Soviet Union "Bienchen"™, "Jet"™ developed in the USA, and the Hungarian vaccination device "Viper"™) and are described at great length in several patent documents and published patent

The particles may have a diameter of 0.2 to 10 µm.

applications (e.g., DE 34 67 301, EP 0 119 286, US 4 966 581, DE 31 15 373) ~~incorporated herein by reference~~). Up to the present, they have not been used in plants.

The injection devices of the mentioned kind are devices wherein the medium to be injected leaves the jet chamber of the device through a nozzle under such an energy that an injection without needle is possible. A generated short pressure burst forms the injection opening with desired depth required for the injection medium. The injection depth can be varied by the angle and the distance of the device to the surface to be injected: for example, the closer the nozzle to the surface, the deeper the injection cone.

The pressure required for shooting out the medium to be injected can be generated in various manners depending on the construction of the injection device. To this end, gas issuing from a sparket bulb (DE 34 67 301) or a pressure pump (DE 31 15 373) can be used as pressure generating means.

The particular advantage of the present invention lies in the fact that the risk of an active substance loss caused by leakage is completely eliminated by using this type of cannula- and needle-free injector. This particularly applies to Injections into unlignified plants wherein the injection opening closes very fast because of the osmotic pressure of the neighbouring cells.

The further advantages achieved by the present invention lie in the fact that the medium to be injected may be present in a flowable, semisolid or solid form. With this type of jet-nozzle-injection it is possible to inject viscous liquids and even highly viscous liquids into plant material by using an appropriate pressure. The reason is that cannulae and needles are not used in this case. Thereby the problem of needle occlusion, e.g., by clogging, is excluded while injection of such a medium will reduce leakage.

The needle-free injection process offers the possibility of injecting media in particulate form. In this case individual particles must have a sufficiently small (microfine) dimension. The preferred particle size is the range of < 1 µm.

In this connection, the active substances may be present either alone or in admixture with one another. They may be dissolved or dispersed in the injection medium.

Active substances which can be administered to plants by means of injection devices without a needle primarily include systemically active plant protection agents (insecticides, acaricides, fungicides, bactericides), as well as plant restoratives and growth regulators.

This is of particular importance since an injection medium that is a viscous liquid and/or one that contains particles may be a formulation that provides for controlled active substance release. Since it is possible with this type of active substance preparation to alter the release profile (duration and rate of release), the needle-free injection process offers the advantage of providing a long-term protection of the objects.

For that reason injection methods without a needle are also suitable in the treatment of wooden articles that require a long-term and persistent protection, e.g. the wooden elements of plant supports (corrective frames, posts) in professional horticulture.

Another important advantage achieved by using needle-free injection devices is the saving in working time. These devices allow rapid working and they are robust and relatively long-lived. Since they are sterilizable by autoclaving they can also be used in such active substance administrations where freedom of viruses or risk of viral Infections is important, for example, in the cultivation of virus-free species or in meristem multiplication.

The present invention will be illustrated in greater detail by the following examples:

Example 1

An amount of 2.5 parts by weight of powdery polyacrylic acid (Carbopol ETD 2050) was dispersed In 97 parts by weight of water, 0.5 parts by weight of the active substance Al-fosetyl was added to the suspension thus produced. The added active substance was homogeneously distributed in the mass under constant stirring. The active substance-containing aqueous acrylic acid dispersion having a relative viscosity of 0.86 Pa-s (at 25 degrees C. according to Brookfield LVF/measuring body) was then filled into a pressure-actuated needle-free injection device (type Dermo-Jet) and injected Into- plant tissue at the base of a one-year-old raspberry sprout (Rubus idaeus) at a pressure of 8.1 bar.

Example 2

An amount of 0.9 g of salicylic acid (resistance inducer for plants) was dissolved in 500 ml of distilled water under heating to 30°C. 100 ml of the solution thus obtained was filled into a pressure-actuated needle-free injection device (type Dermo-Jet) and injected into plant tissue at the shoot axis base of a tobacco plant (Nicotiana tabakum).

CLAIMS

1. Use of a needle-free pressure-actuated injection device as known in human and veterinary medicine for injecting a controlled release formulation into plant material, wherein the formulation is in a flowable solid, semi-solid or viscous liquid form and providing that when the formulation contains solids, the solids are particles having a diameter of 0.1 to 5.0 μm.

2. The use according to claim 1, wherein the formulation comprises said particles.

3. The use according to claim 2, wherein the particles have a diameter of 0.2 to 1.0 μm.

4. The use of claim 1, 2 or 3, wherein the particles comprise an active agent selected from the group consisting of systemically active plant protection agents, plant restoratives, growth regulators, and fertilizers.

5. The use of claim 1, wherein the formulation is in the form of said viscous liquid and comprises an active agent selected from the group consisting of systemically active plant protection agents, plant restoratives, growth regulators, and fertilizers.

6. The use of any one of claims 1 to 5, wherein the plant material is that of a living plant.

7. The use of claim 6, wherein the living plant is a woody plant.

8. The use of any one of claims 1 to 5, wherein the plant material is an unlignified shoot of a living plant.

9. The use of claim 1, 2 or 3, wherein the plant material is wood and the particles comprise a wood treatment agent.

10. The use of claim 1, wherein the plant material is wood, the formulation is in the form of said viscous liquid and the formulation comprises a wood treatment agent.