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(54) **APPARATUS AND METHOD FOR ANIMAL DENTAL CLEANING**

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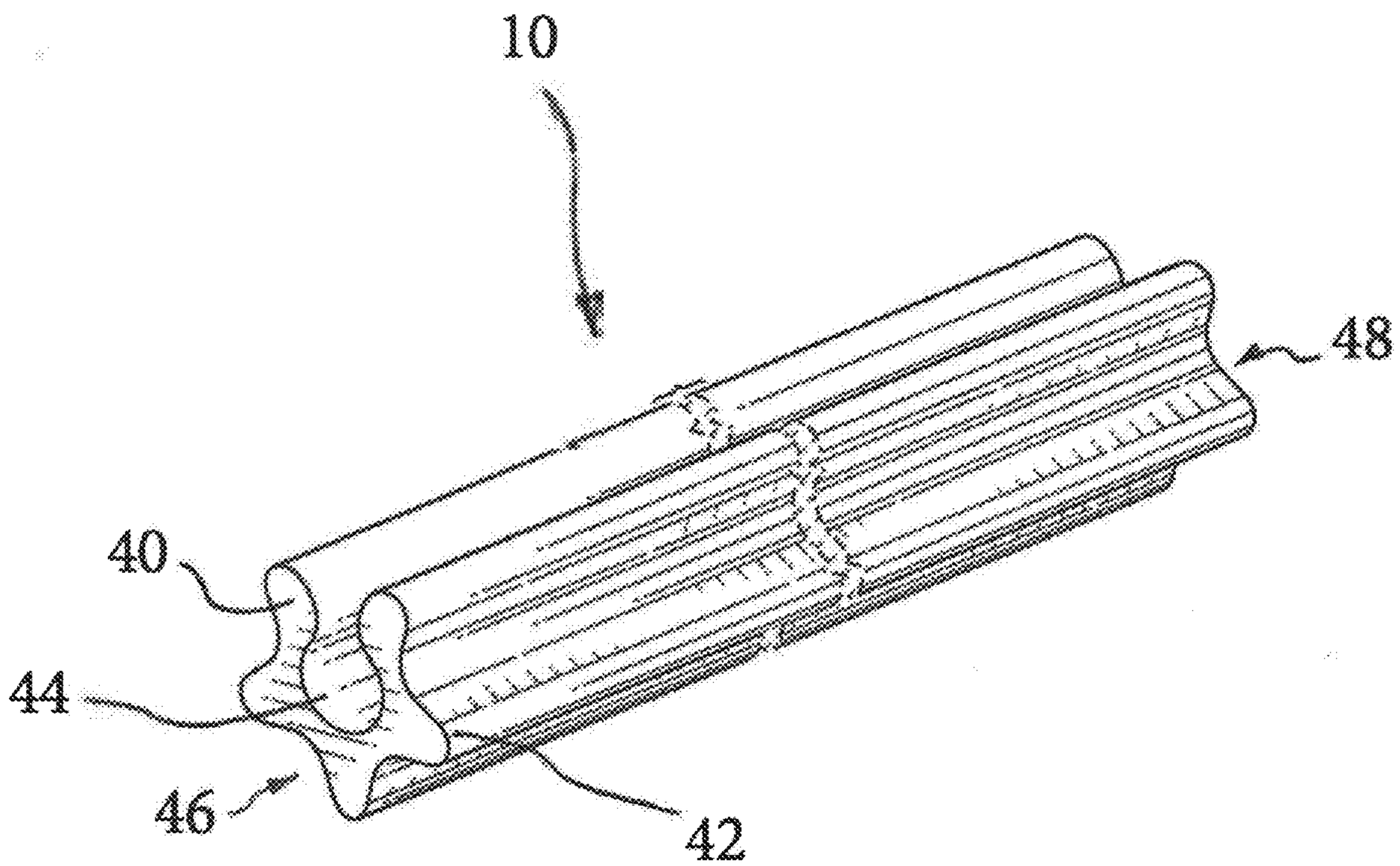
(57) **ABSTRACT**

An edible chew for oral delivery of a substance includes a body portion having a plurality of protrusions and an open channel extending longitudinally along the body portion, the channel configured to receive the substance for oral delivery. The channel includes a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured to inhibit removal of the substance by the animal without ingestion of the edible chew.



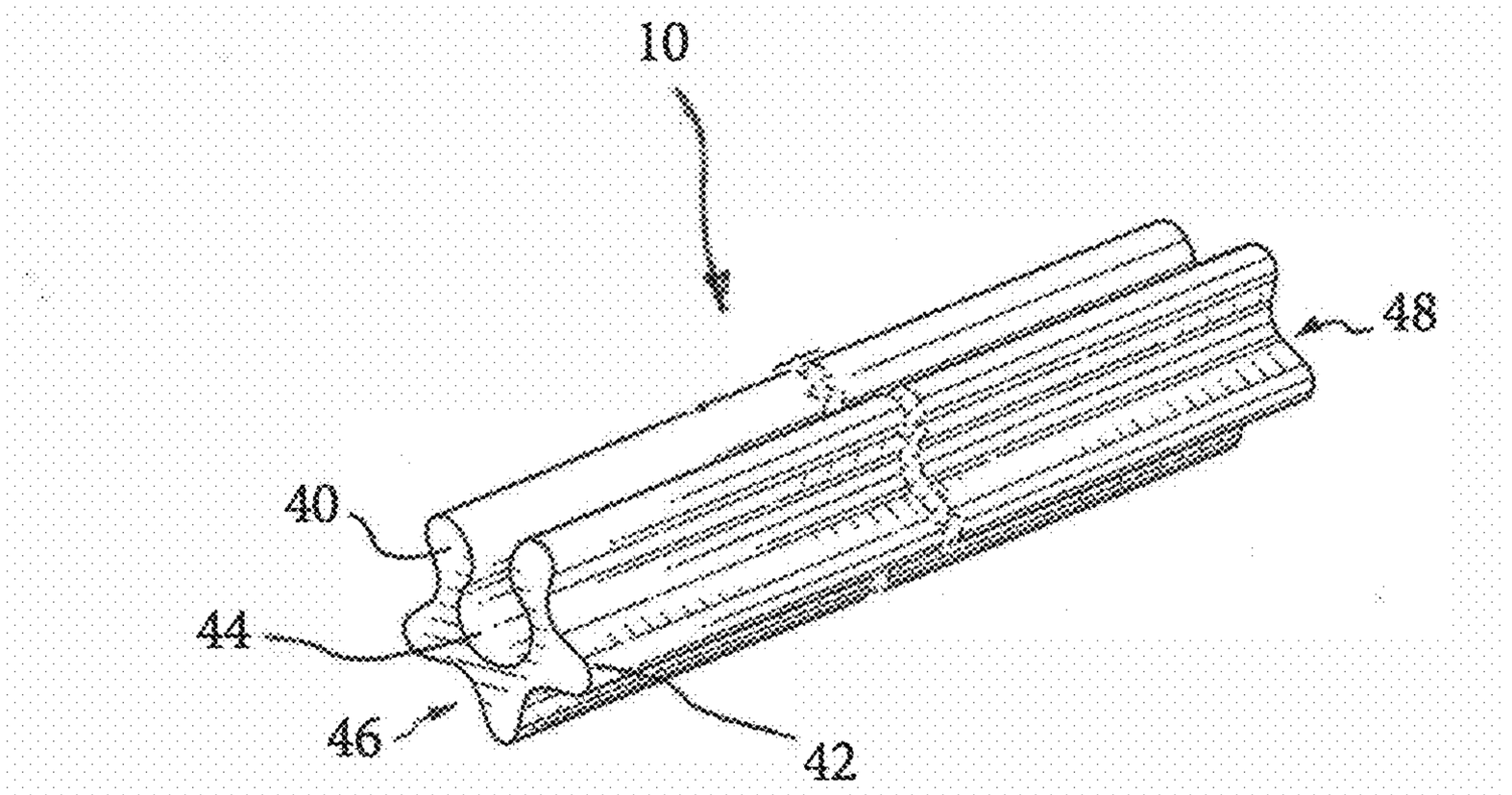


FIG. 1

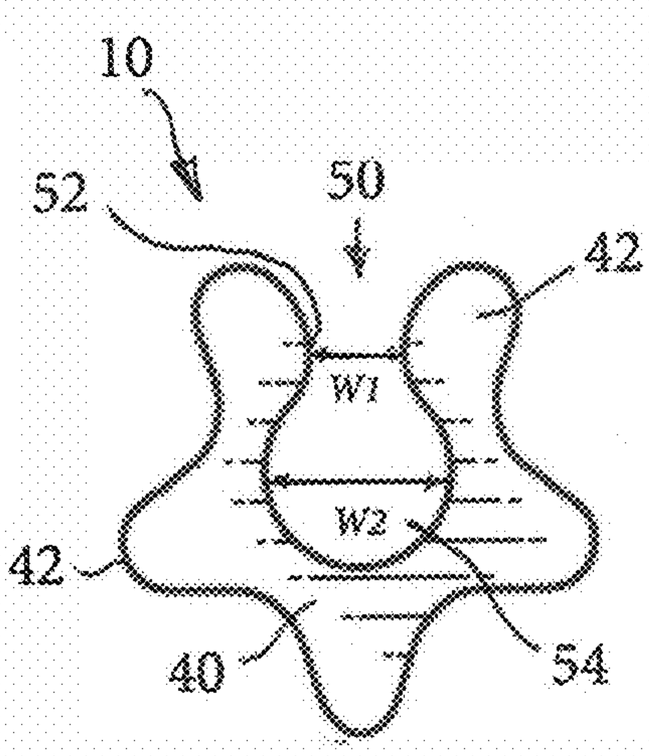


FIG. 2

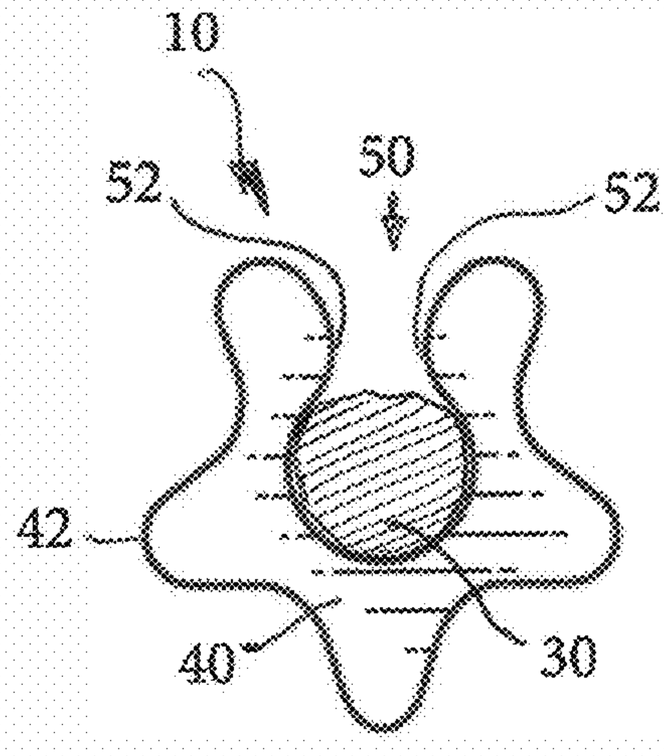


FIG. 3

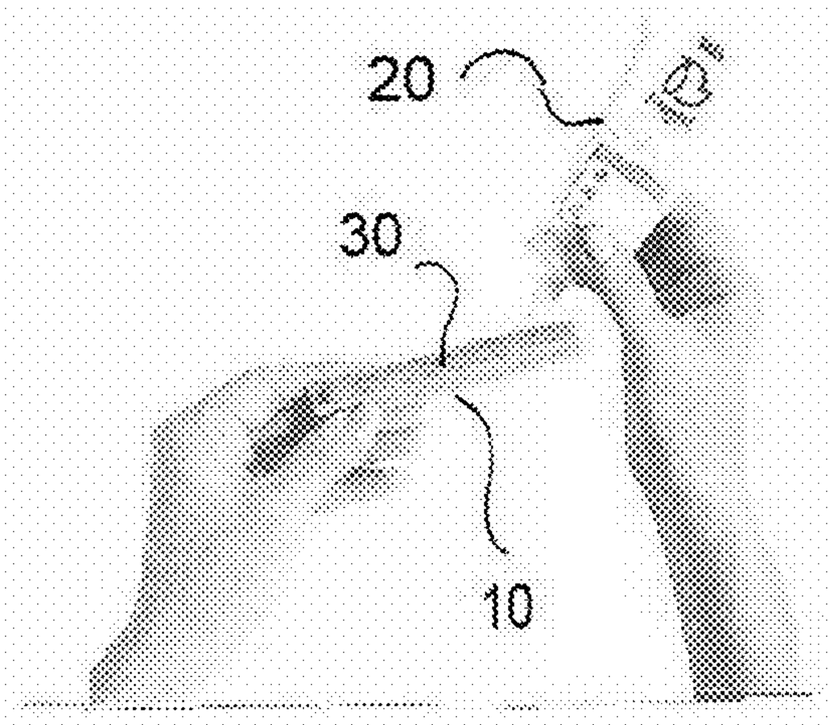


FIG. 4A

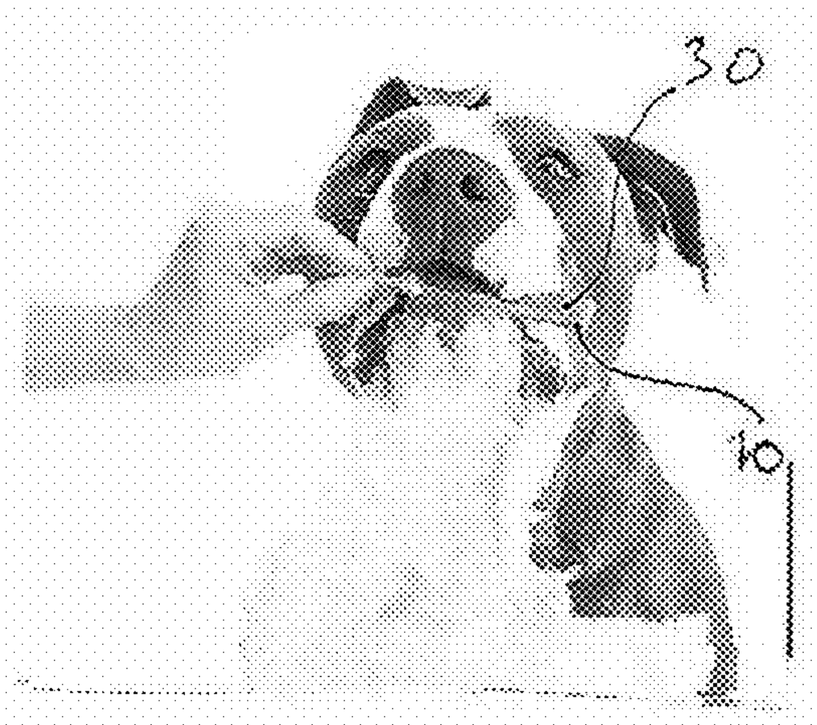


FIG. 4B

APPARATUS AND METHOD FOR ANIMAL DENTAL CLEANING

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application Serial No. 63/082,581, which is hereby incorporated by reference in its entirety.

TECHNICAL FIELD

[0002] The present invention relates generally to the field of animal dental products, and, in particular, to an apparatus, system and method for dental cleaning via a dental chew and cleaning agent.

DISCUSSION OF ART

[0003] Oral health is an important issue for domesticated animals such as dogs and cats. The diet of such animals, e.g., canned and dried foods, may not include natural teeth cleaning agents that would be found in a traditional diet. As a result, the American Veterinary Dental College estimates that 80% of dogs and 70% of cats over the age of three develop oral disease, i.e., an infection of the teeth, gums, and mouth, which can lead to serious health issues. More specifically, oral disease may start off with bad breath and discolored teeth, but can progress to cessation of eating dried food or chewing toys due to discomfort and pain. If untreated, it can lead to tooth loss and, in some instances, heart disease as bacteria in the mouth pass into the bloodstream and accumulate in pets' arteries.

[0004] To clean the teeth, gums, and mouths of pets, veterinarians are often utilized. While effective, professional cleanings can be costly and may require anesthesia. As a result, such cleanings may not occur frequently enough to ensure oral health. Moreover, home treatments with a toothbrush, and potentially toothpaste or gel, may be difficult to accomplish as the pet may not be compliant and the treatment may not be tolerated. Edible 'dental chews' may also be employed. Such chews typically have external features designed to break up plaque and stimulate pets' gums. These chews may not be effective, however, as their external features and/or composition may not provide adequate cleaning, and they do not facilitate the use of a toothpaste.

BRIEF SUMMARY OF THE INVENTION

[0005] The following presents a simplified summary of the disclosed subject matter in order to provide a basic understanding of some aspects of the various embodiments described herein. This summary is not an extensive overview of the various embodiments. It is not intended to exclusively identify key features or essential features of the claimed subject matter set forth in the claims, nor is it intended as an aid in determining the scope of the claimed subject matter. Its sole purpose is to present some concepts of the disclosure in a streamlined form as a prelude to the more detailed description that is presented later.

[0006] With this is mind, to solve the above technical problem, embodiments of the invention provide an edible chew configured for effective oral delivery of a substance such as a dental cleaning agent.

[0007] In an embodiment, an edible chew for oral delivery of a substance to an animal includes a body portion having a plurality of protrusions configured to interact with the animal's teeth, gums and/or related oral structures. The chew further includes an open channel extending longitudinally along the body portion, the channel configured to receive the substance for oral delivery. The channel includes two opposed shoulder portions and a cavity, the shoulder portions and cavity being configured prevent removal of the substance by the animal without ingestion of the edible chew.

[0008] In another embodiment, a system for oral delivery of a dental cleaning composition includes an edible chew having a body portion featuring a plurality of protrusions. The chew further including an open channel extending longitudinally along the body portion, the channel configured to receive the dental cleaning composition, the channel including a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured prevent removal of the dental cleaning composition by the animal without ingestion of the edible chew. The system further includes a dental cleaning composition, doses of which may be placed within the open channel of the chew for oral delivery.

[0009] In yet another embodiment, a method of orally delivering a dental cleaning composition to an animal includes placing a dose of dental cleaning composition within an open channel of an edible chew, the open channel extending longitudinally along a body portion of the edible chew and including a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured prevent removal of the dental cleaning composition by the animal without ingestion of the edible chew. The method further includes providing the edible chew with dental cleaning composition to an animal for consumption.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] The present invention will be better understood from reading the following description of non-limiting embodiments, with reference to the attached drawings, wherein below:

[0011] FIG. **1** is a perspective view of an edible chew, shown broken away and bracketed to indicate the chew can be of various lengths, according to an embodiment of the invention;

[0012] FIG. **2** is an end view of the edible chew of FIG. **1**;

[0013] FIG. **3** is an additional end view of the edible chew of FIG. **1**;

[0014] FIG. **4**A is an illustration of an edible chew and dental cleaning agent according to an embodiment of the invention; and

[0015] FIG. **4**B is an illustration of an oral delivery of a dental cleaning agent via the edible chew of FIG. **4**A.

DETAILED DESCRIPTION OF THE INVENTION

[0016] The following detailed description is merely exemplary in nature and is not intended to limit the described embodiments or the application and uses of the described embodiments. As used herein, the word "exemplary" or "illustrative" means "serving as an example, instance, or illustration." Any embodiment described herein as "exemplary" or "illustrative" is not necessarily to be construed as preferred or advantageous over other embodiments. All of the embodiments described below are exemplary embodi-

ments provided to enable persons skilled in the art to make or use the embodiments of the disclosure and are not intended to limit the scope of the disclosure, which is defined by the claims.

[0017] It is also to be understood that the specific devices and processes illustrated in the attached drawings, and described in the following specification, are simply exemplary embodiments of the inventive concepts defined in the appended claims. Specific dimensions and other physical characteristics relating to the embodiments disclosed herein are therefore not to be considered as limiting unless the claims expressly state otherwise.

[0018] Referring generally to FIGS. **1-4**B, embodiments of the present invention include an edible chew **10**, which has an open interior or channel **44** that is configured to receive a dental cleaning agent **30**, e.g., toothpaste or tooth gel, a dose of which may be distributed to the channel **44** via a compressible tube **20** or other vessel. Once the dose has been placed within the channel **44**, the chew **10** is provided to an animal for oral delivery of the cleaning agent **30**.

[0019] Turning now to FIGS. **1-3**, embodiments of the edible chew **10** have a body portion **40** that has an elongated shape or profile and includes a plurality of protrusions **42** that extend longitudinally along the length of the chew **10**. The protrusions **42** may extend from one distal end **46** of the chew **10** to an opposite distal end **48**. While the protrusions **42** are shown as rounded or domed in shape, they may have other shapes, provided they effectively engage with the teeth, gums, and/or related structures within an animal's mouth.

[0020] As shown, the plurality of protrusions may include five longitudinally extending ribs **42**. The ribs **42** are evenly spaced about the body portion **40** of the edible chew **10**. As will be appreciated, greater or less than five ribs may be employed in various other embodiments.

[0021] Referring again to FIGS. **1-3**, the body portion **40** also features an open channel **44**. The channel **44** extends longitudinally along and into the body portion **40** from distal end to distal end of the chew **10**. In embodiments, the channel **44** may open on a top surface of the chew **10** as well as on one or both distal ends **46**, **48** of the chew **10**.

[0022] As shown, the channel **44** includes a channel opening **50**, having two opposed shoulder portions **52**. The shoulder portions **52** may be formed as part of one or more (e.g., two) of the longitudinal protrusions **42**, or may be internal to the channel **44** and not protrude from the body portion **40**. The shoulder portions **52** extend inward to create a narrowed neck that opens or transitions into cavity **54** of the channel **44**. The channel opening **50** is sized to allow an applicator tip of a cleaning agent vessel to extend into the channel **44** and deliver a dose of the cleaning agent into the cavity **54**.

[0023] The shoulder portions **52** define the width of the channel opening **50**. This width, W**1**, is less than the width, W**2**, of the cavity **54**. In particular, the width of the channel opening **50** at its widest point in the channel **44** is less than the width of the cavity **54**, at its widest point in the channel **44**. In embodiments, the width of the cavity **54** may be about 1.5 to about 2 times the width of the channel opening **50**.

[0024] The shoulder portions **52** extend into the channel **50** to inhibit, i.e., limit or substantially prevent, an animal from removing the cleaning agent or other substance from the chew **10**, without first chewing/ingesting the chew **10**. As will be appreciated, animals may wish to simply lick the cleaning agent off the chew **10** thereby preventing the beneficial synergistic effect of using the chew **10** as a toothbrush to distribute the cleaning agent throughout the animal's mouth. The shoulder portions **52** inhibit this from happening, increasing the efficacy of the chew **10**. This aspect is important, as the combination of the chew **10** and cleaning agent **30** provides effective dental cleaning.

[0025] Referring to FIG. **3**, once a dose of the cleaning agent **30** is placed within the cavity **54**, a majority of the surface area of the dose **30** is surrounded by the body portion **40**. That is, a majority of the surface area of the dose **30** is not exposed through the channel opening **50** and thus not available for extraction via licking.

[0026] The cavity **54** may be sized to hold a specific dose of cleaning agent. In embodiments, the cavity is configured to hold a 2 ml dose of enzyme containing toothpaste or tooth gel. The cavity **54**, and chew **10**, may varying in size depending on the size of the animal receiving the cleaning agent or other substance and/or the size of the dose to be orally administered. In embodiments, the chew may be offered in small, medium and large sizes depending on height, weight, and/or type of animal.

[0027] The cavity **54** may also have a variety of shapes. While it is depicted having a rounded, annular cross-sectional shape, this shape may vary. For example, the cavity **54** may be squared, angled, etc. In certain embodiments, the **54** may come preloaded with the cleaning agent **30** or may be filled with the cleaning agent prior to use.

[0028] As mentioned, the chew **10** is edible, i.e., composed of materials capable of ingestion or biodegradation. Such materials may be compressed or solidified. By way of non-limiting examples, materials may include grains or cereals or processed animal byproducts. As will be appreciated, the materials may be tailored to form specific flavors or compositions suitable for different target animal species.

[0029] In a specific embodiment, the edible chew **10** includes potato starch, gelatin, pea protein chicken, vegetable glycerin, lecithin, natural smoke flavor, citric acid and mixed tocopherols. As will be appreciated, other formulations with different ingredients may be employed, though a relatively high protein, low fat and low-calorie chew may be desirable.

[0030] In embodiments, that edible chew **10** may be manufactured through an extrusion process. In other embodiments, other manufacturing processes may be utilized.

[0031] In embodiments, the cleaning agent **30** is an enzymatic toothpaste (or tooth gel) containing a plurality of active enzymes, e.g., amyloglucosidase, glucose oxidase and lactoperoxidase. A combination of enzymes helps break up harmful microbes and clean teeth and supports the healthy anti-microbial processes already happening in an animal's mouth, but with a much greater level of enzyme activity. Though described with three enzymes, other cleaning agents may be employed utilizing other numbers/combinations of enzymes, e.g., two or more enzymes. In certain embodiments, a cleaning agent having single enzyme may be utilized.

[0032] In a specific embodiment, the cleaning agent **30** is a tooth paste or gel that includes water, lactose-free skim milk powder, glycerol, sorbitol, chicken powder; microcrystalline cellulose, alginate, citric acid, enzymes (amyloglucosidase, glucose oxidase and lactoperoxidase), potassium sorbate, and carboxymethyl cellulose.

[0033] As will be appreciated, in certain embodiments, the edible chew **10** may be used to deliver a substance other than a dental cleaning agent. In this regard, the definition of "substance" is meant to include any composition that is orally administrable to an animal via chew **10**. For example, a veterinarian may compound an unappealing active ingredient (pharmaceutical or otherwise) into a gel or paste that includes an appealing flavor, e.g., chicken, pork, or beef, and place the resulting substance into the open channel **44** of the edible chew **10** for effective oral delivery.

[0034] In use, a "cleaning agent," which includes, but is not limited to, conventional toothpastes, tooth gels, and the like, as well as multi-enzymatic toothpastes and gels, is applied to the channel in the chew **10**. As shown in FIGS. **4**A and **4**B, the cleaning agent **30** may be placed within the chew **10**, via a compressible tube or like vessel. The chew **10** with cleaning agent **30** is then provided to the dog or other animal. The edible chew, and its starches, scrub at the plaque buildup on the animal's teeth, which exposes more surface area for enzymes in the dog's mouth to work.

[0035] It is anticipated that the inventive edible chew **10** will be utilized on a daily basis, though other intervals may be possible.

[0036] The above description of illustrated embodiments of the subject disclosure, including what is described in the Abstract, is not intended to be exhaustive or to limit the disclosed embodiments to the precise forms disclosed. While specific embodiments and examples are described herein for illustrative purposes, various modifications are possible that are considered within the scope of such embodiments and examples, as those skilled in the relevant art can recognize. For example, parts, components, steps and aspects from different embodiments may be combined or suitable for use in other embodiments even though not described in the disclosure or depicted in the figures. Therefore, since certain changes may be made in the above-described invention, without departing from the spirit and scope of the invention herein involved, it is intended that all of the subject matter of the above description shown in the accompanying drawings shall be interpreted merely as examples illustrating the inventive concept herein and shall not be construed as limiting the invention.

[0037] In this regard, while the disclosed subject matter has been described in connection with various embodiments and corresponding figures, where applicable, it is to be understood that other similar embodiments can be used or modifications and additions can be made to the described embodiments for performing the same, similar, alternative, or substitute function of the disclosed subject matter without deviating therefrom. Therefore, the disclosed subject matter should not be limited to any single embodiment described herein, but rather should be construed in breadth and scope in accordance with the appended claims below. For example, references to "an embodiment" or "one embodiment" of the present invention are not intended to be interpreted as excluding the existence of additional embodiments that also incorporate the recited features.

[0038] In the appended claims, the terms "including" and "in which" may be used as the plain-English equivalents of the respective terms "comprising" and "wherein." Moreover, in the following claims, terms such as "first," "second," "third," "upper," "lower," "bottom," "top," etc. are merely labels, and are not intended to impose numerical or positional requirements on their objects. The terms "substantially," "generally," and "about" indicate conditions within reasonably achievable manufacturing and assembly tolerances, relative to ideal desired conditions suitable for achieving the functional purpose of a component or assembly. Further, the limitations of the following claims are not written in means-plus-function format and are not intended to be interpreted as such, unless and until such claim limitations expressly use the phrase "means for" followed by a statement of function void of further structure.

[0039] In addition, the term "or" is intended to mean an inclusive "or" rather than an exclusive "or." That is, unless specified otherwise, or clear from context, "X employs A or B" is intended to mean any of the natural inclusive permutations. That is, if X employs A; X employs B; or X employs both A and B, then "X employs A or B" is satisfied under any of the foregoing instances. Moreover, articles "a" and "an" as used in the subject specification and annexed drawings should generally be construed to mean "one or more" unless specified otherwise or clear from context to be directed to a singular form.

[0040] What has been described above includes examples of systems and methods illustrative of the disclosed subject matter. It is, of course, not possible to describe every combination of components or methodologies here. One of ordinary skill in the art may recognize that many further combinations and permutations of the claimed subject matter are possible. Furthermore, to the extent that the terms "includes," "has," "possesses," and the like are used in the detailed description, claims, appendices and drawings, such terms are intended to be inclusive in a manner similar to the term "comprising" as "comprising" is interpreted when employed as a transitional word in a claim. That is, unless explicitly stated to the contrary, embodiments "comprising," "including," or "having" an element or a plurality of elements having a particular property may include additional such elements not having that property.

[0041] This written description uses examples to disclose several embodiments of the invention, including the best mode, and also to enable one of ordinary skill in the art to practice the embodiments of invention, including making and using any devices or systems and performing any incorporated methods. The patentable scope of the invention is defined by the claims, and may include other examples that occur to one of ordinary skill in the art. Such other examples are intended to be within the scope of the claims if they have structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

[0042] Further aspects of the invention are provided by the following clauses

[0043] 1. An edible chew for oral delivery of a substance comprising: a body portion having a plurality of protrusions; an open channel extending longitudinally along the body portion, the channel configured to receive the substance for oral delivery; and wherein the channel includes a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured to inhibit removal of the substance by the animal without ingestion of the edible chew.

[0044] 2. The edible chew of clause 1, wherein the two opposed shoulder portions define a width of the channel opening, the width of the channel opening being less than a width of the cavity.

[0045] 3. The edible chew of clause 1, wherein a majority of surface area of a dose of the substance may be contained within the channel and not exposed through the channel opening

[0046] 4. The edible chew of clause 1, wherein the plurality of protrusions includes five longitudinally extending ribs each extending from a first distal end of the chew to a second distal end opposite the first distal end

[0047] 5. The edible chew of clause 4, wherein two of the ribs also form the shoulder portions of the channel

[0048] 6. The edible chew of clause 4, wherein the ribs are substantially evenly spaced about the body portion

[0049] 7. The edible chew of clause 1, wherein the channel is open longitudinally along the body portion as well as on at least one distal end of the chew.

[0050] 8. The edible chew of clause 1, wherein the channel includes a dose of the substance for oral delivery

[0051] 9. The edible chew of clause 1, wherein the substance is an enzyme containing toothpaste or tooth gel

[0052] 10. A system for oral delivery of a dental cleaning agent comprising: an edible chew that includes: a body portion having a plurality of protrusions; an open channel extending longitudinally along the body portion, the channel configured to receive the dental cleaning composition, the channel including a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured to inhibit removal of the dental cleaning composition by the animal without ingestion of the edible chew; and a dental cleaning agent, doses of which may be placed within the open channel of the chew for oral delivery.

[0053] 11. The system of clause 10, wherein the dental cleaning agent is an enzyme containing toothpaste or tooth gel.

[0054] 12. The system of clause 11, wherein the enzyme containing toothpaste or tooth gel includes amyloglucosidase, glucose oxidase and lactoperoxidase

[0055] 13. The system of clause 10, wherein the two opposed shoulder portions define a width of the channel opening, the width of the channel opening being less than a width of the cavity.

[0056] 14. The system of clause 10 wherein a majority of surface area of a dose of the cleaning agent may be contained within the channel and not exposed through the channel opening

[0057] 15. The system of clause 10 wherein two of the protrusions also form the shoulder portions of the channel

[0058] 16. The system of clause 10 wherein the channel is open longitudinally along the chew as well as on at least one distal end of the chew

[0059] 17. The system of clause 10 wherein the plurality of protrusions includes five longitudinally extending ribs each extending from a first distal end of the chew to a second distal end opposite the first distal end

[0060] 18. The system of clause 17 wherein the ribs are substantially evenly spaced about the body portion

[0061] 19. A method of orally delivering a dental cleaning composition to an animal comprising the steps of: placing a dose of dental cleaning agent within an open channel of an edible chew, the open channel extending longitudinally along a body portion of the edible chew and including a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured to inhibit removal of the dental cleaning agent by the animal without ingestion of the edible chew; and providing the edible chew with dental cleaning agent to an animal for consumption

[0062] 20. The method of clause 19 wherein the step of placing the dose includes squeezing the dose from a tube containing the dental cleaning agent

[0063] 21. The method of clause 20 wherein the dental cleaning agent is an enzyme containing toothpaste or tooth gel

[0064] 22. The method of clause 21 wherein the toothpaste or tooth gel includes amyloglucosidase, glucose oxidase and lactoperoxidase

[0065] 23. The method of clause 21 wherein the two opposed shoulder portions define a width of the channel opening, the width of the channel opening being less than a width of the cavity.

What is claimed is:

1. An edible chew for oral delivery of a substance comprising:

a body portion having a plurality of protrusions;

an open channel extending longitudinally along the body portion, the channel configured to receive the substance for oral delivery; and

wherein the channel includes a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured to inhibit removal of the substance by the animal without ingestion of the edible chew.

2. The edible chew of claim **1**, wherein the two opposed shoulder portions define a width of the channel opening, the width of the channel opening being less than a width of the cavity.

3. The edible chew of claim **1**, wherein a majority of surface area of a dose of the substance may be contained within the channel and not exposed through the channel opening.

4. The edible chew of claim **1**, wherein the plurality of protrusions includes five longitudinally extending ribs each extending from a first distal end of the chew to a second distal end opposite the first distal end.

5. The edible chew of claim **4**, wherein two of the ribs also form the shoulder portions of the channel.

6. The edible chew of claim **4**, wherein the ribs are substantially evenly spaced about the body portion.

7. The edible chew of claim **1**, wherein the channel is open longitudinally along the body portion as well as on at least one distal end of the chew.

8. The edible chew of claim **1**, wherein the channel includes a dose of the substance for oral delivery.

9. The edible chew of claim **1**, wherein the substance is an enzyme containing toothpaste or tooth gel.

10. A system for oral delivery of a dental cleaning agent comprising:

an edible chew that includes:

a body portion having a plurality of protrusions;

an open channel extending longitudinally along the body portion, the channel configured to receive the dental cleaning composition, the channel including a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured to inhibit removal of the dental cleaning composition by the animal without ingestion of the edible chew; and

a dental cleaning agent, doses of which may be placed within the open channel of the chew for oral delivery.

11. The system of claim **10**, wherein the dental cleaning agent is an enzyme containing toothpaste or tooth gel.

12. The system of claim **11**, wherein the enzyme containing toothpaste or tooth gel includes amyloglucosidase, glucose oxidase and lactoperoxidase.

13. The system of claim **10**, wherein the two opposed shoulder portions define a width of the channel opening, the width of the channel opening being less than a width of the cavity.

14. The system of claim **10** wherein a majority of surface area of a dose of the cleaning agent may be contained within the channel and not exposed through the channel opening.

15. The system of claim **10** wherein two of the protrusions also form the shoulder portions of the channel.

16. The system of claim **10** wherein the channel is open longitudinally along the chew as well as on at least one distal end of the chew.

17. The system of claim **10** wherein the plurality of protrusions includes five longitudinally extending ribs each extending from a first distal end of the chew to a second distal end opposite the first distal end.

18. The system of claim **17** wherein the ribs are substantially evenly spaced about the body portion.

19. A method of orally delivering a dental cleaning composition to an animal comprising the steps of:

placing a dose of dental cleaning agent within an open channel of an edible chew, the open channel extending longitudinally along a body portion of the edible chew and including a channel opening, having two opposed shoulder portions, and a cavity, the channel opening, shoulder portions and cavity being configured to inhibit removal of the dental cleaning agent by the animal without ingestion of the edible chew; and

providing the edible chew with dental cleaning agent to an animal for consumption.

20. The method of claim **19** wherein the step of placing the dose includes squeezing the dose from a tube containing the dental cleaning agent.

21. The method of claim **20** wherein the dental cleaning agent is an enzyme containing toothpaste or tooth gel.

22. The method of claim **21** wherein the toothpaste or tooth gel includes amyloglucosidase, glucose oxidase and lactoperoxidase.

23. The method of claim **21** wherein the two opposed shoulder portions define a width of the channel opening, the width of the channel opening being less than a width of the cavity.

* * * * *