United States Patent

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[54] **FLAVORED DRINKING STRAW**
11 Claims, 4 Drawing Figs.

[52] **U.S. Cl.** ..... **99/138 R,** 99/171 B
[51] **Int. Cl.** **A23l 1/26**
[50] **Field of Search** ..... 99/28, 138 R, 171 B, 78; 239/33; 229/75; 215/1 A

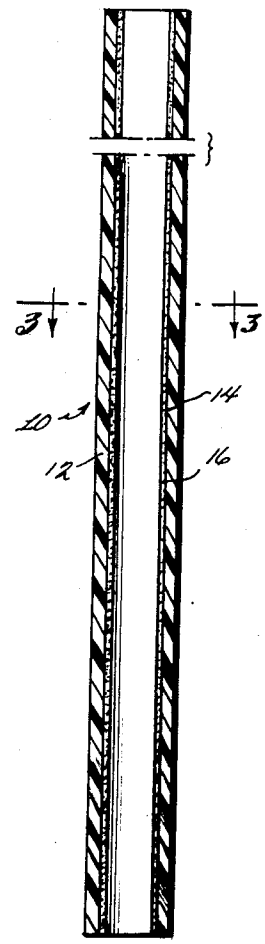
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1,996,203	4/1935	Hollingsworth	99/138
2,846,313	8/1958	Menkin et al.	99/138
2,983,616	5/1961	Levi	99/138

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ABSTRACT: A tubular drinking straw having at least a portion of an exposed wall formed of a water insoluble hydrophilic acrylate or methacrylate polymer. A water soluble flavoring agent is dispersed within the polymer and passes by way of the polymer to flavor the liquid in which the straw is placed.



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Fig. 1

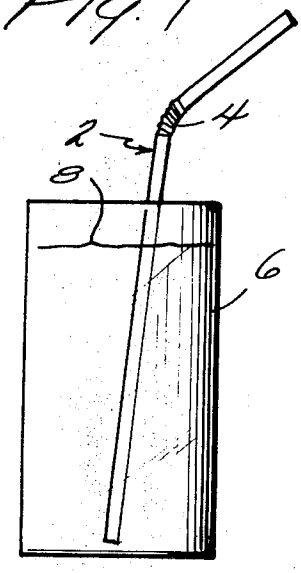


Fig. 2

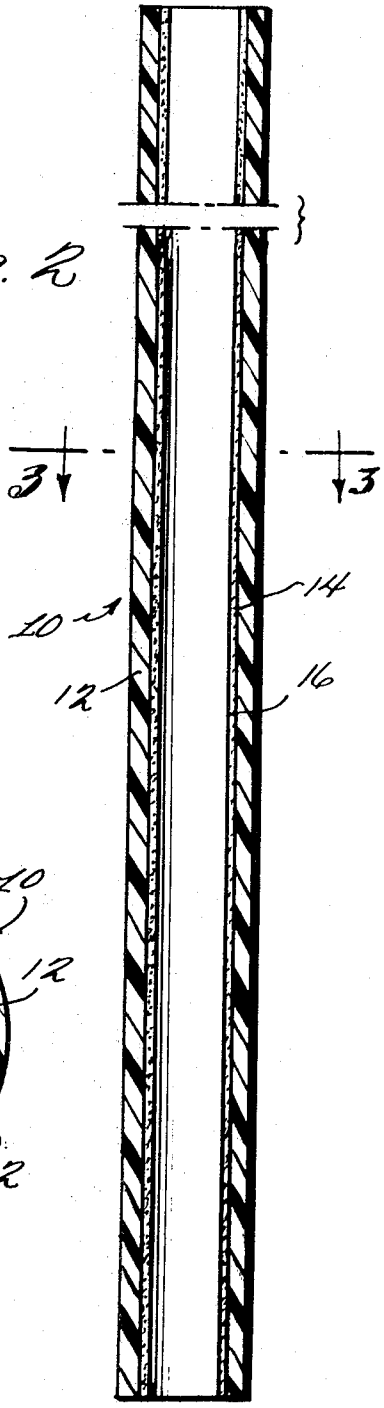
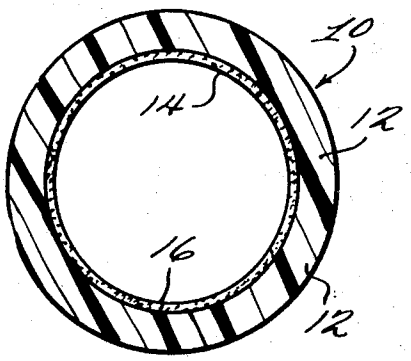


Fig. 3



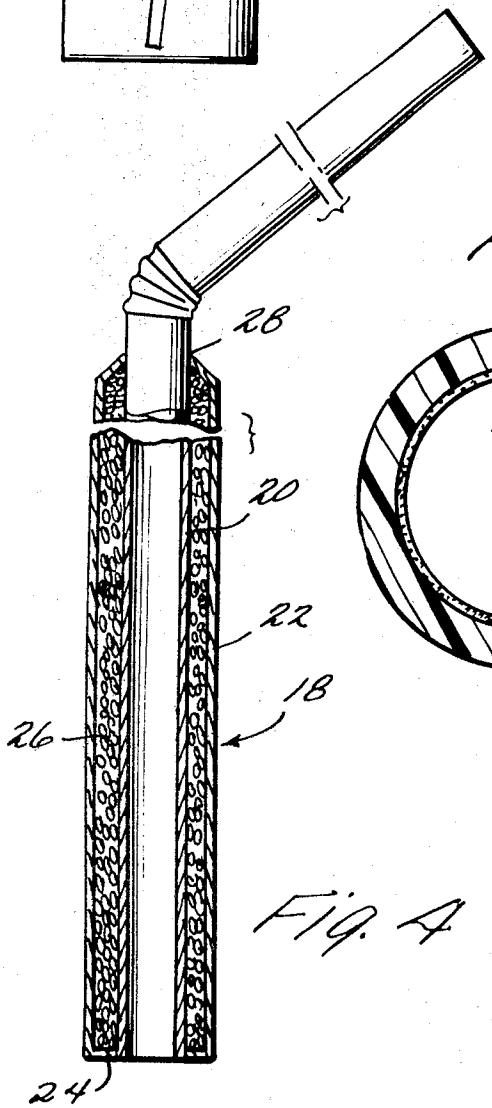


Fig. 4

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FLAVORED DRINKING STRAW

The present invention relates to a novel drinking straw.

It has previously been proposed to make a flavor containing drinking straw, Mead U.S. Pat. No. 2,867,536. Mead provides a closure at the bottom of his tube which must be removed at the time of use so that particles of flavoring agent can flow out of the tube into the vessel containing water. Not only is it troublesome to remove this closure but there is the problem of particles packing and not flowing out of the tube. There is also the problem of possible spillage when the closure is removed. Levi U.S. Pat No. 2,983,616 discloses a flavored drinking straw which is a laminate of three layers which are spirally wound around a mandrel. The outermost layer is made of an impervious material, the middle layer of wet strength paper and the innermost layer of an absorbent material impregnated with a soluble flavor. The intermediate wet strength paper layer and the outer layer are adhered together by an adhesive while the inner absorbent layer and wet strength paper are adhered together by the sticky consistency of the flavoring agent. There is the problem of obtaining adequate impregnation of the absorbent. Additionally, the method of manufacture of the straw is somewhat cumbersome. Furthermore such straws are not suitable for use with powdery flavorants such as chocolate, tea or coffee for example.

Accordingly it is an object of the present invention to make an improved flavored drinking straw.

Another object is to provide a flavored drinking straw in which the flavoring agent is retained when dry but is readily released when the straw is placed in water.

An additional object is to provide a flavored drinking straw containing powdered flavoring agent.

Still further objects and the entire scope of applicability of the present invention will become apparent from the detailed description given hereinafter; it should be understood, however, that the detailed description and specific examples, while indicating preferred embodiments of the invention are given by way of illustration only, since various changes and modifications within the spirit and scope of the invention will become apparent to those skilled in the art from this detailed description.

It has now been found that these objects can be attained by making a drinking straw at least in part of a water insoluble hydrophilic acrylate or methacrylate polymer having entrapped therein a water soluble flavoring agent.

As the flavoring agent there can be employed chocolate, tea, coffee, strawberry, orange, lemon, lime, cherry, chocolate or vanilla malt. The invention is particularly valuable with powdered water soluble flavoring agents such as powdered chocolate (including alkali treated chocolate), instant coffee powder, instant tea powder and malted milk powder. Conventional additives such as sugar can be present, e.g. the chocolate can be a blend of 1 part chocolate with 1.3 parts of sugar or with 2 parts of sugar by weight. There can also be present powdered milk, nonfat dry milk, cream or cream substitutes, e.g. coffee powder can be blended with powdered cream or cream substitute. There can also be blended with the flavoring agent artificial sweeteners such as calcium cyclamate, sodium cyclamate, sodium saccharin or the like.

The flavoring agent is entrapped in the hydrophilic acrylate or methacrylate and upon placing the straw in an aqueous liquid such as water, milk or skim milk the hydrophilic polymer takes up the liquid and the water soluble flavoring agent gradually passes into the aqueous liquid giving a flavored drink.

As the hydrophilic acrylate or methacrylate polymer there can be employed homopolymer and copolymers of hydroxy lower alkyl acrylates and methacrylates or hydroxy lower alkoxy lower alkyl acrylates or methacrylates, e.g. 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, diethylene glycol monoacrylate, diethylene glycol monomethacrylate, 2-hydroxypropyl acrylate, 2-hydroxypropyl methacrylate, 3-hydroxypropyl acrylate, 3-hydroxypropyl methacrylate and dipropylene glycol methacrylate. The preferred monomer is 2-hydroxyethyl methacrylate. The water insoluble hydrophilic polymers are swellable in water, usually to 35 to 90 percent.

While homopolymers can be employed in the invention frequently it is preferred to employ a cross-linking agent. Consequently the small amount of diacrylate or dimethacrylate normally present in hydroxyalkyl acrylates and methacrylates need not be removed before forming the polymer.

The cross linking-agent is preferably present in an amount of 0.1 to 2.5 percent although as little as 0.05 percent or up to 20 percent of cross-linking agent can be used. The hydrophilic acrylates and methacrylates are nontoxic and naturally nontoxic cross-linking agents are preferred. Typical examples of cross-linking agents include ethylene glycol diacrylate, ethylene glycol dimethacrylate, 1,2-butylene dimethacrylate, 1,3-butylene dimethacrylate, 1,4-butylene dimethacrylate, propylene glycol diacrylate, propylene glycol dimethacrylate, diethylene glycol dimethacrylate, dipropylene glycol dimethacrylate, diethylene glycol diacrylate, dipropylene glycol diacrylate, divinyl benzene, divinyl toluene, diallyl tartrate, allyl pyrivate, allyl malate, divinyl tartrate, triallyl melamine, N,N'-methylene bis acrylamide, glycerine trimethacrylate, diallyl maleate, divinyl ether, diallyl monoethylene glycol citrate, ethylene glycol vinyl allyl citrate, allyl vinyl maleate, diallyl itaconate, ethylene glycol diester of itaconic acid, divinyl sulfone, hexahydro-1,3,5-triacryl triazine, triallyl phosphite, diallyl ester of benzene phosphoric acid, polyester of maleic anhydride with triethylene glycol, polyallyl glucose, e.g. triallyl glucose, polyallyl sucrose, e.g. pentaallyl sucrose, sucrose diacrylate, glucose dimethacrylate, pentaerythritol tetraacrylate, sorbitol dimethacrylate, diallyl aconitate, divinyl citraconate, diallyl fumarate, citraconic acid, itaconic acid, fumaric acid, maleic acid, aconitic acid, mono 2-hydroxyethyl itaconate, mono 2-hydroxypropyl itaconate, mono 2-hydroxyethyl maleate, mono 2-hydroxypropyl fumarate, mono methyl itaconate, acrylic acid, methacrylic acid.

There can also be included minor amounts, e.g. 1 to 25 percent preferably not over 10 percent, of other monomers which are not cross-linking such as alkoxyethyl acrylates and methacrylates, e.g. 2-methoxyethyl acrylate, 2-methoxyethyl methacrylate and 2-ehoxyethyl methacrylate, insaturated amino compounds, e.g. p-aminostyrene, 2-amino-4-vinyltoluene, diethylaminoethyl acrylate, diethylaminoethyl methacrylate, dimethylaminoethyl acrylate, dimethylaminoethyl methacrylate, t-butylaminoethyl methacrylate, piperidinoethyl acrylate, 2-vinyl pyridine, dimethylaminopropyl methacrylate, amides, e.g. acrylamide, methacrylamide, N-isopropyl acrylamide, N-isopropyl methacrylamide, diacetone acrylamide, diacetone methacrylamide, methylol acrylamide, methylol methacrylamide, N-(2-hydroxyethyl) methacrylamide, etc.

The polymers are old per se and are found in the literature. The preferred polymers are Hydron S (2-hydroxyethyl methacrylate homopolymer which is thermoplastic) and Hydron (infrequently cross-linked copolymer of 2-hydroxyethyl methacrylate with less than 2 percent ethylene glycol dimethacrylate and thermosetting).

The mixture of hydrophilic acrylate or methacrylate polymer and flavoring agent can be prepared by any conventional technique. Thus for example a mixture of 10 parts of chocolate powder and 90 parts of powdered Hydron S can be placed in an extruder and extruded in the form of a tube to make the drinking straw. Of course there can be used powdered coffee or tea or a mixture of 7 parts sugar and 3 parts chocolate in place of the chocolate powder.

Unless otherwise indicated all parts and percentages are by weight.

To reduce expense it is not necessary to make the entire straw of the hydrophilic acrylate or methacrylate polymer. Thus there can be included other polymers such as polyethylene, polypropylene, polyvinyl chloride or polyesters, e.g. polyethylene terephthalate.

For example there can be extruded a powdered mixture of 80 parts polyethylene, 20 parts Hydron S and 10 parts tea to form a drinking straw.

The straws can also be formed by casting. This procedure is particularly convenient when employing a thermosetting resin such as Hydron.

Thus 2 parts of instant coffee powder can be intimately mixed with 100 parts of 2-hydroxyethyl methacrylate and 0.2 part of ethylene glycol and 0.15 part of isopropyl percarbonate (catalyst) and the mixture cast into a mold in the form of a tube and the mixture heated at 40° C. to form a drinking straw having the coffee entrapped therein.

For increased strength (and reduced cost) it is also possible to extrude or cast a tube of polyethylene, polypropylene, polyvinyl chloride or the like and then cast the Hydron polymer containing powdered chocolate, coffee or tea as either an internal or external coat or as both an internal and external coat thereon without the use of an adhesive. The Hydron in this case is applied in liquid form either as a prepolymer, monomer or monomerpolymer mixture containing the powdered flavoring agent and polymerization is completed to form the Hydron itself containing the entrapped flavoring agent.

The invention will be understood best in connection with the drawings wherein:

FIG. 1 is a plan view of a drinking straw according to the invention;

FIG. 2 is a broken sectional view of another form of the invention;

FIG. 3 is a sectional view along the line 3—3 of FIG. 2; and

FIG. 4 is a broken sectional view of another form of the invention.

Referring more specifically to FIG. 1 of the drawings there is shown a drinking straw 2 made of Hydron S containing entrapped coffee. The Hydron S and coffee were dry mixed and then extruded to form the straw. Alternatively the straw can be made by casting. The straw has pleats at 4 so that it can be bent in any desired direction. While the use of such pleats is preferred since the whirling action imparted to liquid sipped through the straw will aid the coffee to enter the liquid it is not essential to the invention that such a pleated straw be used. Thus the straw can be of conventional tubular design. The straw 2 is shown sitting in a glass 6 filled with water 8. As explained when the drinking straw is placed in water due to the hydrophilic nature of the Hydron S it will take up water and swell. At the same time the entrapped coffee is released and goes into the water with the result that when water is sipped through the straw it has a coffee flavor. Instead of making the straw 2 completely of Hydron S it can be made by extruding a mixture of Hydron S and another polymer such as an olefin polymer, e.g. polyethylene, polypropylene, or ethylene propylene copolymer for example.

FIG. 2 illustrates another form of drinking straw according to the invention. The drinking straw 10 is prepared by simultaneously extruding a relatively thick external tube 12 of polypropylene and a relatively thin internal tube 14 of Hydron S. Dispersed throughout the inner tube are particles 16 of chocolate and sugar as a result of dry blending the sugar and chocolate with particles of Hydron S prior to the extrusion.

In place of forming the tube 14 by extrusion it can also be formed by casting incompletely polymerized Hydron or Hydron S containing the chocolate and sugar between the tube of polypropylene and an inner mandrel and then completing the polymerization of the Hydron or Hydron S and removing the mandrel.

FIG. 4 shows a drinking straw 18 made of Hydron. The straw comprises a cylindrical inner tube 20 and a coaxial cylindrical outer tube 22. The annulus formed by tube 20 and outer tube 22 is joined together at the bottom edges of the tubes by surface or plate 24 which has a central opening corresponding to the bore of inner tube 20. Instant tea powder 26 is supplied to the space between inner tube 20 and outer tube 22 and is retained therein due to the plate-like surface 24. To prevent spillage of tea the upper space between tubes 20 and 22 can be closed off in any suitable fashion after the tea is added. Thus the outer tube can be heated in the upper portion sufficiently to soften it and then pinched to seal it as at 28 to the inner tube.

In the embodiment set forth in FIG. 4 the inner tube can be made of the hydrophilic polyacrylate or polymethacrylate and the outer tube made of polyethylene, polypropylene or alternatively the outer tube can be made of the hydrophilic polyacrylate or polymethacrylate and the inner tube made of polyethylene or polypropylene. In any of these methods of forming the drinking straw when suction is applied to the upper end of the straw water containing tea will rise through the straw.

The form of the invention in which the flavoring agent is intimately mixed with the hydrophilic polymer is preferred since the quickest and most uniform solution of the flavoring agent in the water, milk, skim milk or the like will occur.

There is no need of employing an adhesive in the invention and there is no danger of disintegration of the hydrophilic acrylate or methacrylate polymer in contrast to the situation when using an absorbent fibrous material such as absorbent cellulose. Additionally the hydrophilic polymer and flavoring agent can be dry mixed according to the invention which is particularly advantageous in forming extruded drinking straws. Furthermore there is no need to rely upon the relatively slow absorption which occurs when using absorbent cellulose.

What is claimed is:

1. A tubular drinking straw having an exposed wall comprising a hydrophilic, water insoluble acrylate or methacrylate polymer selected from the group consisting of hydroxy lower alkyl acrylates, hydroxy lower alkyl methacrylates, hydroxy lower alkoxy lower alkyl acrylates and hydroxy lower alkoxy lower alkyl methacrylates, said polymers having dispersed therein a water soluble drink flavoring agent, whereby when the straw is placed in water the flavoring agent passes by way of the polymer to the water.

2. A drinking straw according to claim 1 wherein said polymer is a polymer of a compound selected from the group consisting of 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, diethylene glycol monoacrylate, diethylene glycol monomethacrylate, 2-hydroxypropyl acrylate, 2-hydroxypropyl methacrylate, 3-hydroxypropyl acrylate, 3-hydroxypropyl methacrylate, dipropylene glycol methacrylate.

3. A drinking straw according to claim 1 wherein said polymer is a polymer of a compound selected from the group consisting of hydroxy lower alkyl acrylates and hydroxy lower alkyl methacrylates.

4. A drinking straw according to claim 1 wherein the straw has a single wall said wall being uniform in composition from its interior to its exterior surface comprising an intimate mixture of said flavoring agent and said polymer.

5. A drinking straw according to claim 4 wherein said polymer is a polymer of 2-hydroxyethyl methacrylate and said flavoring agent is in dry form and comprises a member of the group consisting of coffee, tea and chocolate.

6. A drinking straw according to claim 1 wherein the acrylate or methacrylate is the sole polymer in the wall.

7. A drinking straw according to claim 1 wherein the acrylate or methacrylate polymer in the wall is blended with a thermoplastic strengthening polymer.

8. A drinking straw according to claim 1 wherein the straw has a single wall said wall being composed of a thermoplastic strengthening polymer having on at least one of its exposed surfaces a coating of said hydrophilic acrylate or methacrylate polymer.

9. A drinking straw according to claim 8 wherein the strengthening polymer and the hydrophilic polymer are in direct contact with no adhesive in between.

10. A drinking straw according to claim 9 wherein said polymer is a polymer of 2-hydroxyethyl methacrylate and said

flavoring agent is in dry form and comprises a member of the group consisting of coffee, tea and chocolate.

11. A drink straw according to claim 1 wherein the straw has two concentric sidewalls providing a space therebetween, a bottom wall closing the space between the sidewalls and permanently united to said sidewalls and a water soluble drink flavoring agent in said space, at least one of said walls comprising said polymer.

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