Sept. 13, 1960 M. PLANIN 2,952,462

TOY

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FIG. 1.

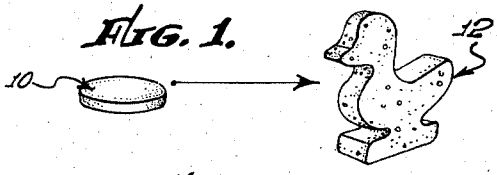


FIG. 2.

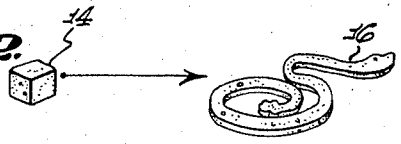


FIG. 3.

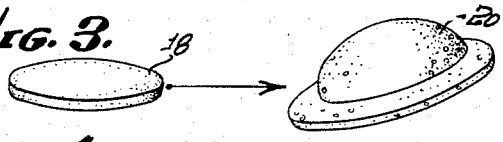


FIG. 4.

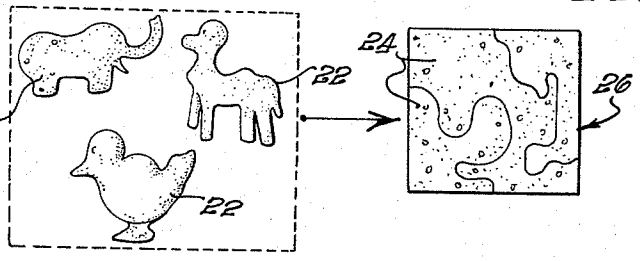


FIG. 5.

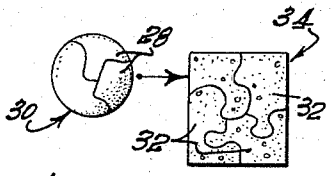


FIG. 6.

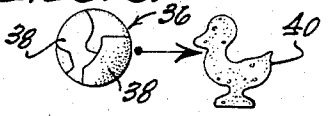


FIG. 7.

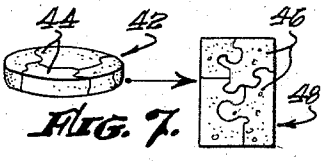


FIG. 8.

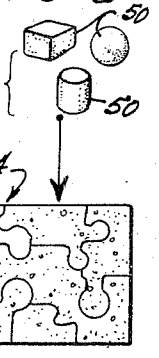


FIG. 9.

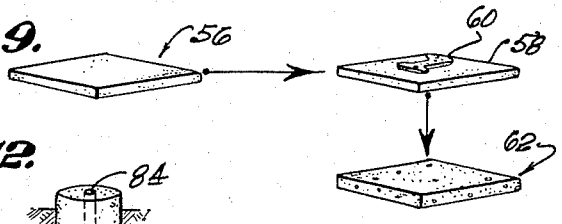
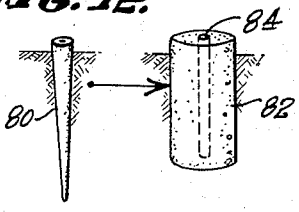


FIG. 12.



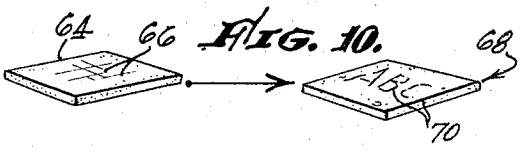


FIG. 10.

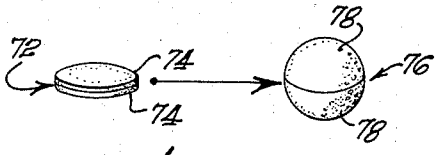


FIG. 11.

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FIG. 13.

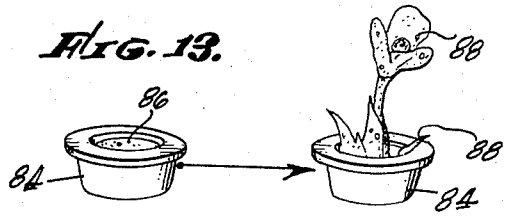


FIG. 15.

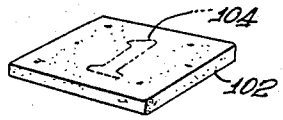


FIG. 14.

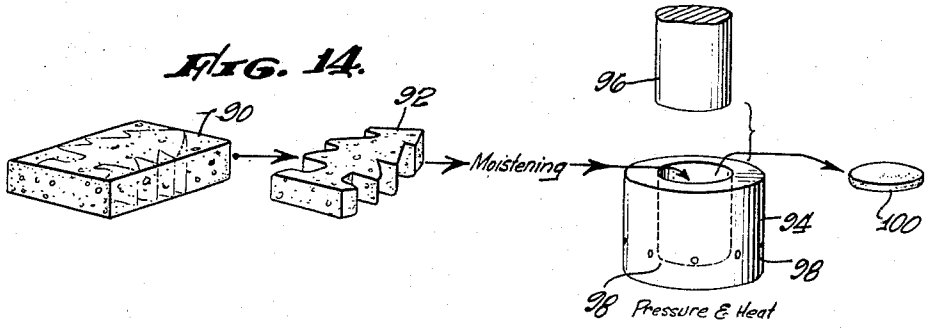


FIG. 16.

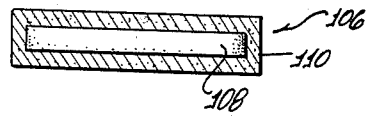


FIG. 17.

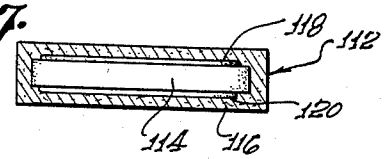
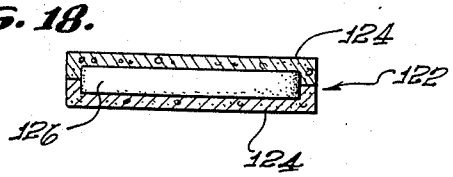


FIG. 18.



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Filed June 29, 1956, Ser. No. 594,871

8 Claims. (Cl. 273—157)

The present invention relates to new and useful articles of manufacture.

It may be stated that the articles of manufacture falling within the scope of this invention are amusement articles or toys, although this is not considered to be a completely accurate statement indicating the complete nature of this invention. Many of the articles of manufacture of this invention are primarily designed for advertising purposes, and in some instances as will be specifically indicated, they possess other utility besides this. Further, in its broad aspects this invention encompasses articles which may be used for amusement, advertising, and utilitarian purposes.

It is difficult to state precisely what, in a toy or an advertising device, serves to catch the attention of an individual so that a toy or advertising device can satisfactorily achieve the purpose for which it has been designed. In essence both toys and advertising devices may be termed amusement devices since they are both designed to catch the attention of an individual. Literally hundreds of thousands of dollars have been invested in attempting to develop so-called "sure fire" amusement articles capable of being used to attract the attention of either adults or children or both.

It now appears that satisfactory amusement devices finding a market can nearly always be produced utilizing some mechanism causing an essentially unexpected action or result. With the present invention such an unexpected action or result is achieved through articles capable of absorbing liquid so as to expand to a shape or configuration differing from the initial shape or configuration of these articles. Preferably the change in shape should be of essentially a "drastic" category in which all three dimensions of the initial article are altered as a result of absorbing liquid. Further, it is preferred that at least one of the shapes, that is, either the initial or the final, have a completely different appearance from the other of the shapes.

A broad object of the present invention is to provide a number of different classes of articles of manufacture as indicated in the preceding paragraph. In order to understand this broad objective of the invention it is considered necessary to explain the various terms used in the preceding in describing articles of the invention. An article of manufacture in accordance with this disclosure may be made in the shape of a disc, a cube, or the like, and this article, when placed in a liquid such as water will absorb this liquid so as to turn into an entirely different expanded shape, such as, for example, the shape of a small toy animal, a tree, or any other desired article.

Because water is the most common liquid readily available in the average household or business office, it is preferred to manufacture articles in accordance with this invention of a hydrophylic composition. When such articles are in their initial configuration they are preferably dehydrated, or substantially dehydrated, so that the molecular structure of these articles is such that they

readily remain in the desired dehydrated configuration, even when subjected to physical abuse. The molecular structure of these expanded articles is preferably such that when they are placed within a liquid such as water that this water is absorbed into the molecular structure so as to cause this structure to swell, resulting in these articles going to a second or expanded configuration as indicated. It is considered obvious from this that any article of manufacture of the present invention must be created by a procedure in which the basic molecular structure or nature of the article is not affected so as to change the liquid absorbing, or the hydrophylic, characteristics of such articles.

In order to manufacture the articles indicated it has been found that it is most advantageous to take and form an article into a final or hydrated shape, corresponding to the extending shape described above. Next in the process of this invention these intermediate articles are compressed, preferably in more than one dimension, and liquid is removed from them as by a combination of heat and pressure so as to create a solid, non-liquid-containing article having what is referred to above as an "initial" shape. If desired, such an article may be coated or otherwise modified in various manners so as to achieve special effects, and may be formed as a toy or amusement device.

Amongst the special effects which may be achieved with articles of manufacture of this invention are the release of gas bubbles, the non-uniform expansion of certain portions of the initial articles, and the like. Depending upon the specific commercial application, any or all of these effects can be created with articles of manufacture of the present invention. Further, these articles can, if desired, be formed of various materials having household and other utility, or can be formed of a completely digestible composition. If the latter is done, it is preferred to utilize digestible agents in the creation of special effects as indicated.

Rather than encumber this specification with a further generalized description of this invention and with a long list of various objects corresponding to every possible embodiment of the invention it is deemed preferable to refer to the remainder of this description, the appended claims and the accompanying drawings for a complete indication of the nature of this invention. Other objects of the invention, as well as many specific advantages of it will be fully apparent to those familiar with the field to which this invention pertains from this description, these claims and these drawings.

It may be stated in essentially summary form that the invention is primarily concerned with articles capable of absorbing liquid so as to expand to a shape or configuration differing from the initial shape or configuration of these articles. Unfortunately, a summary of this category standing alone is not sufficiently complete to indicate the true nature of these articles.

A number of different classes of chemical materials or compositions may be used in manufacturing these articles. Probably the most advantageous material, because of its cheapness, availability, ease of manufacture, as well as its exceedingly high water-absorption properties, and its ability to withstand moderate temperatures during dehydration without disrupting the molecular structure, is what is commonly termed "viscose." Regenerated cellulose in the viscose form may, in the manufacture of articles of this invention, be formed directly into the shape of a final expanded article, or may be cut to the final shape desired from a mass of expanded material.

Other materials capable of being used in manufacturing articles of this invention include various starch compositions formed in a sponge-like structure created, as by the general procedure described in U.S. Patents 2,597,011

and 2,442,928. If desired, such starch sponges can be formed from starch blends containing various proportions of amylose and amylopectin so as to achieve water-solubility and other characteristics as desired. Such starch sponges are considered to be particularly desirable for many applications because they are completely digestible. If necessary they can be reinforced with fibrous materials, or even created by being blended with other compositions such as, for example, any of a number of plant hydrocolloid materials, or the equivalents of the same such as, for example, various chemically modified cellulose derivatives. As an example of the latter mention can be made of carboxymethyl cellulose, ethyl cellulose, and the like.

The articles of this invention can also, if desired, be manufactured directly from a number of plant hydrocolloid materials or their equivalents as briefly indicated in the preceding. As an example of this, certain compositions based upon locust bean gum can be satisfactorily employed as the basic material for an article of manufacture of this invention. In conjunction with this gum specific note should be made as to the suitability of locust bean gum which has been cross-linked wtih epichlorohydrin. Other hydrocolloids of this variety, such as gum karaya, guar gum, agar, cross-linked pectins and the like can also be utilized. Many of such hydrocolloids are best employed by creating a gel of these materials and water, and then treating this gel so as to remove water from it. A sponge-like structure utilizing them can be obtained by the basic type of freezing procedure described in the aforesaid patents relating to starch sponges. This structure may be then treated so as to form an article of manufacture of this invention. Such plant hydrocolloid materials can, if desired, be reinforced with various fibers and the like.

Such reinforcement is not generally considered necessary when water absorbent polymers of a purely synthetic variety are utilized with the invention. As an example of such synthetic polymers reference is made to certain compositions based upon polyurethane derivatives.

The actual use of any of these compositions in articles of manufacture in accordance with this invention, the nature of these articles and the use of these articles is best explained by referring to the accompanying drawings in which:

Figs. 1 to 13 inclusive, are perspective views of various articles of manufacture of this invention in their initial and expanded shapes;

Fig. 14 is a flow sheet indicating a process of manufacturing articles of manufacture of this invention;

Fig. 15 is a perspective view of an article of manufacture of this invention; and

Figs. 16 to 18, inclusive, are cross sectional views of various modified articles of manufacture of this invention.

It is to be understood that the accompanying drawings are not to be taken as limiting this invention in any respect. They are primarily designed so as to illustrate certain preferred embodiments of the invention. Those skilled in the art to which this invention pertains can readily create an almost infinite variety of articles utilizing the features herein explained by merely following the essential teachings of this invention set forth in this specification.

The nature of the various articles of manufacture falling within the scope of the present invention is best explained from a consideration of the drawings. In the initial figures a number of different articles of manufacture are illustrated so as to show both their initial and their expanded shapes, and, in certain instances, the use of various parts or articles in conjunction with one another. All of the articles illustrated in these initial figures may be conveniently formed out of viscose sponge by processes such as will be explained subsequently so that in their initial configuration they are solid and are either completely non-liquid containing or substantially non-liquid containing; in their expanded configuration all of these articles are shown in what may be termed a hydrated or expanded shape, such as may be achieved by immersing them in a container of water. Obviously these articles retain their hydrated, expanded shape after once being hydrated when water is removed from them by squeezing or the like in the same manner in which a common household viscose sponge retains its configuration when dry after having been used with water.

The article **10** of this invention shown in Fig. 1 may take the shape of a common disc **10** resembling a coin. It is comparatively hard and non-porous in nature as are the other articles of a similar nature herein described. It is sufficiently non-hydroscopic in character so as not to pick up water from the air or during handling to any material extent. When, however, this article is immersed in water it will absorb water so as to assume the shape of an article **12** of any desired configuration, such as for example, a duck as shown. The duck **12** may be used directly as a toy by a child in a bathtub or the like, and can even be employed as an aid to washing similar to any other conventional sponge. The articles **10** and **12** are distinguishable from each other by virtue of the nature of the molecular structure in them; in the article **10** the molecular structure of the viscose is strained, but the forces developed within the article by drying are sufficient to hold this article together in a completely different shape from that achieved by hydration. In its hydrated form the molecular structure of the article is relaxed, and may be termed essentially the "natural" hydrated structure.

If desired an article **14** (Fig. 2) may be created, which, when hydrated, yields an elongated toy such as, for example, a snake **16**. The article **14** is shown in the shape of a cube, although obviously it can be of other shapes. As an example of this it can be formed essentially as a disc or the like so that the snake **16** appears during hydration essentially as a result of unwinding or unfolding. If desired an article **18** of the class described (Fig. 3) can be formed so that upon hydration it achieves a completely utilitarian form. Thus, the article **18** is shown as reverting to the shape of a hat **20** of the category occasionally worn by individuals for beach wear or the like. Other shapes and configurations besides those illustrated can be used for the articles **18** and **20**.

It is not to be assumed from the aforegoing that any of the articles of manufacture of this invention have to appear in their initial shape or configuration essentially as a disc or a cube. For example it is possible to form a plurality of articles **22** (Fig. 4) having an initial configuration of the shape of animals or like toys. When these articles **22** are immersed in water they become hydrated so as to take on the shape of pieces **24** of a composite puzzle **26** of the common picture puzzle variety. If desired, these pieces may be interlocking with respect to one another so that they may be assembled together by a child playing in a bathtub or the like. This latter is frequently very important since children tend to like to play with puzzles, games and the like while bathing. The density of common viscose in its hydrated state is such that this material floats readily upon the surface of the water.

It is not necessary to form pieces of a picture puzzle which may be considered as separate and independent toys. If desired a number of separate articles **28** (Fig.5) each similar in structure to the article **10** described above can be manufactured so as to fit together in either a two-dimensional or a three-dimensional inter-locking puzzle **30**. The particular puzzle **30** illustrated is patterned after the type of puzzle commonly sold in novelty stores as key-chain ornaments or the like. When the individual pieces **28** are hydrated they form parts **32** of a composite two-dimensional puzzle **34** as illustrated. If desired the

puzzle 30 may be manufactured so that the individual pieces 28 come apart automatically on hydration. It is also possible if desired to manufacture either the puzzles 26 or 34 so that the individual pieces of these puzzles may be interlocked with one another in order to form a three-dimensional puzzle of the type of the puzzle 30.

It is considered self-evident that a three-dimensional puzzle 36 (Fig. 6) can be manufactured having pieces 38 which may be pulled apart and hydrated so as to yield a plurality of individual toys such as animals 40. Such hydration and separation may automatically take place when the entire puzzle 36 is immersed as a unit. Any of the parts of the puzzles 26, 30, 34, 36 or subsequently explained puzzles may be formed of different colors as through the use of conventional dyes so as to increase the interest of an individual or moppet in these devices.

If desired a single, solid article 42 (Fig. 7) may be created of a number of separate pieces 44 effectively joined together during manufacture so that the junctions between these pieces are not readily apparent. When the article 42 is hydrated these pieces 44 become pieces or parts 46 of another puzzle 48. Although the puzzle 48 is illustrated as being of a two-dimensional category it is to be understood that it may be three-dimensional in nature. Preferably the pieces 44 are, with this embodiment of the invention, of a single appearance; however, if desired, they may be individually colored in different manners. If desired the pieces 44 can be formed so as to become separate toys upon expanding. In order to heighten the interest in a puzzle-type of construction a number of different separate articles 50 (Fig. 8) having regular geometrical or other shapes may be manufactured of different colors so that a child can guess as to what parts 52 of a composite puzzle 54 these articles will become on expansion. With this type of structure it is considered advantageous to form the articles 50 so that the parts 52 will take on some sort of a conventional appearance upon hydration so as to aid a child in forecasting the shape to which an article 50 will assume.

The invention is not limited to the mere formation of toys. Thus it is possible in accordance with the teachings of this disclosure to form a flat, thin, non-porous dehydrated sheet 56 of viscose which, upon hydration will initially assume an intermediate configuration 58 in which a letter or other advertising or amusement indicia 60 projects from a surface of this article. If desired the initial article 56 may be formed so that on further prolonged hydration it assumes a conventional sponge-like shape 60. The manner in which the article 56 is formed so as to achieve these effects is quite important and will be more specifically described later in this specification. However, it may be stated here for purposes of explanation that the article 56 may be coated with a coating of limited water solubility or little ability to transmit water except where the indicia 60 are to be located. Such a coating may be colorless and substantially invisible, or may be colored as desired; it may be applied as by printing, silk screen processes, etc. If it is not desired that the article 56 attain the shape 62, and/or the ultimate use of this article is not important, as in the case for many advertising purposes such a coating may be substantially water insoluble, and may be incapable of allowing water to pass through it into the article 56.

Other means besides those specifically indicated in the preceding can also be employed where raised indicia are to be utilized. Although such other means will be more fully described later in this specification it can be stated here as an aid to understanding the invention that they include such expedients as chemically reacting part of an article such as an article 56 so as to either completely eliminate the water absorbing qualities of such an article, or so as to severely limit such properties. Physical disruption of parts of the articles 56 as by heat, pressure and/or other means can also be employed for this purpose. Thus, for example, heat applied to viscose in an excess in certain areas of the article 56 will destroy the expansion properties of this article. With other materials, such as, for example, starch sponges, pressure alone when applied in the extreme will disrupt the molecular structure so as to prevent the expansion or hydration of parts of an article formed of this material.

In many cases efficient advertising devices may be created using sheets 64 (Fig. 10) of the invention which have been physically or chemically treated as indicated briefly in the preceding along lines 66. Upon hydration the article 64 assumes a hydrated form 68 in which various advertising or other indicia 70 are recessed within the surface of the article 68. These recesses can prove very advantageous when the article 68 is used for cleaning purposes.

The invention can also be used so as to create various articles having a completely hollow final or expanded configuration. As an example of this article 72 (Fig. 11) of the invention can be formed of two sections 74 glued or otherwise secured together so that upon hydration a ball-like construction 76 formed by two sections 78 derived from the sections 74 through hydration are positioned together defining a hollow interior. The complete article 72 can be of any convenient shape desired; thus, the final article 76 need not be a ball, but can be in the shape of a toy, animal or the like. It is possible to form the article 72 so that only part of the juncture between the pieces 74 is solid. Thus, in the final article, soap or the like may be slipped within the slit resulting from this type of structure into the interior of this article. Any convenient non-water soluble adhesive can be utilized to attach the two sections in this type of structure together. It is also possible to form an article such as the article 72 of a unitary mass of material, although, because of technical complications, this is not normally preferred. If desired the two sections may be stitched as by thread to one another in this type of construction.

Another utilitarian aspect of the invention involves the use of an article 80 (Fig. 12) having the essential appearance of a spike. This article 80 is primarily designed so that it may be driven into soil or the like so that when water is applied to the soil, it will expand forming a convenient means 82 for conveying water and aerating the soil properly. If desired the article 80 may be manufactured so that upon its hydration an opening 84 extends through this article as an aid to conveying liquid or as a storing means for plant nutrients.

It is possible to combine in accordance with the broad teachings of this invention a solid non-porous, non-liquid containing article in conjunction with another article so as to achieve special effects. Thus, for example, a conventional plastic flower pot 84 (Fig. 13) can be manufactured and an article 86, similar to the article 10 in physical and chemical nature, may be inserted within this pot and fastened to the bottom of it by any convenient insoluble adhesive. When the pot 84 is immersed in water, or filled with water various leaves and flowers 89 will appear to grow out of the pot 84. Because of the hydroscopic properties of certain of the materials capable of being used with this invention, these flowers and leaves 88 can be formed so as to expand upward even so as to project out of the liquid in which the article 86 is immersed. If desired, the pot 84 can be formed with a similar material to the article 10 so as to also appear to grow. Obviously this type of construction of the present invention can be employed in a great many ways by magicians and the like. This type of construction also makes an extremely interesting toy or advertising device. If desired a plurality of expanding articles can be used within the pot 84 in this embodiment of the invention, and these articles can be colored differently, or can be attached to one another as by an insoluble adhesive.

The manufacture of any of the articles of this invention such as the article **10** is a compartively simple matter. It may be stated in essentially summary form that any process for forming such articles includes the steps of forming a mass of the basic material to be used into a shape corresponding to the final expanded or hydrated shape desired, moistening the so-shaped mass so that its molecular structure is capable of deformation, compressing the moistened shape into the desired "initial" configuration, and removing all or substantially all of the liquid from it. It should be specifically pointed out that a change in molecular or cell structure or configuration occurs during any process of this category. At the start of the process the material being used may be said to have a "relaxed" or "natural" structure; when the process is finished this structure has been distorted into the final product having an "initial" configuration so that this final product is very compact, dense, substantially non-porous, and so that it does not readily come apart.

As an example of this a common viscose sponge, such as can be purchased in many stores, initially has a porous "natural" structure. In forming articles of this invention by the process steps indicated in Fig. 14 of the drawings a viscose sponge block **90** is cut as by a knife or other equivalent means to a final shape **92**. Within this article **92** the structure of the sponge mass **90** is unaltered. Next the article **92** may be moistened as by dipping in water so as to become hydrated. After this the moistened article is inserted within a mold **94** and is subjected to pressure in at least one dimension as through the use of a plunger **96** so as to change its configuration. Preferably with this type of mold structure some deformation is required to insert the article **92** into the mold. At this time some water is removed from the article **92** by pressure through holes **98** in the mold **94**.

The water removed in this manner is not normally sufficient to completely convert the article **92** into the desired product having the "initial" configuration. To accomplish this it is normally necessary to apply a moderate amount of heat to the mold **94** so as to drive the water off. In general, the article **92** may be heated at any temperature up to about 250° F. with safety so as to cause the production of a final article **100** having the so-called "initial" configuration. If too high temperatures are used during this dehydration process it is possible to disrupt or alter the chemical structure of the viscose so as to prevent it from being capable of reverting to the hydrated shape **92** from the initial shape **100**.

The basic process shown in Fig. 14 can be altered in a large number of different ways. As an example of this the hydrated article **92** can be created out of viscose by forming a so-called "sponge mix" out of viscose (cellulose xanthate) and salt crystals, pressing the sponge mix into an appropriate mold corresponding in configuration to the shape of the hydrated article desired and then placing the mold in a hot coagulating vat for several hours. These treatment steps are essentially conventional in the art of manufacturing sponges from viscose. This type of procedure offers the distinct advantage in that certain of the conventional steps in manufacturing sponges are eliminated.

The type of molding procedure directly yielding an article in a final form described in the preceding is particularly adaptable for use with other materials such as, for example, starch mixtures as discussed in the preceding. This type of basic procedure is simple to explain. First, a viscous starch gel is prepared as described in the U.S. patents described earlier in this specification. This gel is then cast into a mold **102** having an internal configuration corresponding to the hydrated shape desired. The gel is then cooled and preferably frozen as described in these patents. It is then subjected to a very moderate amount of pressure and dried at room temperature so as to form an article having an "initial" configuration.

Care must be used with any starch gel or similar material that an excessive amount of pressure is not applied since a great amount of pressure will tend to disrupt the final sponge structure produced by hydration.

The use of such pressure can, in certain cases, be extremely advantageously employed, however. Thus, for example a sheet **64** such as previously described can be treated prior to, during or subsequent to such dehydration so that the lines **66** are created by pressure applied along these lines serving to disrupt the structure of the material. This is very conveniently done with starch gels, and anyone skilled in the art can determine the amount of pressure required for any given application with a minimum of experimentation. If an article such as the article **56** is to be created pressure alone may be used in all locations except where the expansion characteristics of the material are to remain unaltered.

Because of the nature of viscose it is difficult to achieve the same results with it as a consequence of pressure treatment as can be achieved with starch sponges, although some favorable results can be obtained when using extreme pressure, such as, for example, on the order of several thousand pounds per square inch. It is possible to disrupt the structure of articles having an initial shape as herein described through the use of ultrasonic vibrations and/or heat alone applied in localized areas. As an example of this parts of the article **56** or the article **64**, when these articles are formed of viscose, can be subjected to heat at a temperature sufficient to alter the structure of this article, or even to electric arcs or the like so as to alter their water absorbent properties.

Such alteration can also be achieved through the reaction of various chemical agents, although, because of the complexity of the operations required for this, it is not generally preferred. Such agents can be used so as to form cellulose acetate and other related compounds with viscose in desired areas. Similar agents can also be used with the other materials mentioned earlier in the specification, and the reactions necessary may either be carried out by exposing selected areas to a vapor or to a liquid. In some cases these reactions can be carried out with an article in a hydrated shape or condition prior to the dehydration step mentioned above for creating an "initial" as this term is used in the specification.

Special effects can be created with the articles of this invention by a number of different expedients. As an example of one of these an article **102** is shown in Fig. 15 of the drawings which consists essentially of a flat, dehydrated, non-porous viscose composition derived from a viscose sponge as previously described. Upon the surface of this article an indicia **104** of any desired configuration may be placed by printing, silk-screening or the like. This indicia **104** preferably is of an ink-like composition containing any conventional dye, which, when the article **102** is placed in water, will either become visible or will change color. Such dyes can, of course, be employed with any of the articles previously described.

It is similarly possible to provide, as indicated in Fig. 16, articles **106** of the invention having a central core **108** such as any of the preceding articles surrounded by a coating composition **110**. This coating **110** serves to prevent the article encased within it from damage during physical handling, and to improve the appearance of these articles. A wide variety of materials may be used for the coating **110**. Amongst suitable materials are polyvinyl alcohol, certain compositions based upon agar, pectin, gum tragacanth and the like. One particularly suitable material is a cellophane-resembling composition created from starch. Such coatings may be colored as desired. All of these compositions are characterized by being either soluble in a liquid such as water, or by being of such a chemical nature as to permit water or other liquid to pass through them. When a water trans-

mitting or permeable, insoluble coating is employed the coating is preferably sufficiently thin so that during hydration of the article 108 sufficient force is developed by the swelling to completely disrupt this coating. A coating of this category may be applied by dipping, molding or like processes.

It is not to be assumed from the above that the coating 110 need be disposed solely on the exterior of an article of manufacture of the invention. Thus, for example, it is possible to dip an article into a suitable coating composition when it is in a hydrated or expanded shape, and then to compress and remove liquid from it. This expedient is frequently desirable when an article such as the article 42 is being manufactured since the coating composition serves essentially as a binder helping to hold the pieces 44 together. This article 40 can, however, be created by merely compressing together in their hydrated state a plurality of the pieces 44, and then removing liquid from the composite mass of these pieces.

Articles such as the article 56 can be conveniently created by applying coating compositions as indicated in this discussion to areas where expansion is not desired. In these cases the coatings are conveniently applied by silk screen processes, printing or the like. If desired articles such as the article 56 can be created by utilizing a rigid coating sufficiently thick so as to resist expansion during hydration except where various indicia are desired. Such rigid coatings should preferably be water impervious, although this is not an absolute necessity. Suitable compositions of this sort are cellulose acetate, polyethylene or the like; they may also be applied as these other coatings when in a liquid state, or may be molded around articles having areas corresponding to the desired indicia covered with an adhesive tape or the like.

It is also possible to form articles of this invention such as the article 112 shown in Fig. 17 of the drawings. In this article a center core 114 such as the article 10 or any article of a similar nature previously described is covered with a coating 116 similar to the coating 110. Layers of two different agents 118 and 120 are held upon the core 114 by the coating 116 so that when the article 112 is immersed in a liquid such as water the compositions 118 and 120 will react together so as to produce gas bubbles. For this type of construction the composition 118 may be sodium bicarbonate and the composition 120 may be aluminum sulphate, although obviously a wide variety of other materials or compositions may be used instead of these reagents. If desired, these reagents can be disposed adjacent to one another in pockets in the coating 116, or within small pockets or holes in the core 114. In some cases it is even possible to form a hollow article such as the article 72 where a gas-producing composition is located between the pieces 74 after these pieces have been completely dehydrated. This type of structure is indicated in Fig. 18 where there is shown an article 122 similar to the article 72 formed of pieces 74 joined together as by stitching so that a single powder-type, dry, gas-producing composition 126 of the type occasionally used for fire extinguishers is located between these two pieces.

It is possible to combine any of the special effects indicated in the preceding into a single article of manufacture. In order to keep this specification from becoming unduly complex such combined articles have not been specifically shown and described herein. Also many of the specific manufacturing process details which may be employed have been omitted where these details are essentially of a mechanical nature. Thus, for example, a single block of viscose sponge when dry may be cut with conventional tools so as to have the cross-sectional configuration of a tree or the like; may then be hydrated and compressed into a long rectangle; may next be dehydrated; and finally be again cut into a plurality of blocks, each capable of expanding to a shape corresponding to part of this cross-sectional configuration. A plurality of "initial" articles capable of expanding to a snake like configuration can similarly be created by rolling a sheet of hydrated material, compressing, dehydrating as described, and then cutting the so-processed body in the direction of the rolling in a plane transverse to the axis of the rolled body.

Because of the fact that literally hundreds, if not thousands of modified constructions are possible within the scope of this invention it is to be considered as being limited solely by the appended claims. In order to understand the true scope of this invention due care must be given to consider the use of other equivalent materials to those indicated in this specification in such modified constructions.

I claim:

1. An article of manufacture which comprises a plurality of individual pieces of compressed, dehydrated sponge material at least some of said pieces being differently shaped from other of said pieces, each of said pieces being so shaped that when fitted together they form a puzzle, said pieces being capable of expanding when placed in water so as to expand to a shape other than the initial shape of said pieces.

2. An article of manufacture as defined in claim 1 wherein each of said pieces expands to the shape of a toy when placed in water.

3. An article of manufacture as defined in claim 1 wherein each of said pieces expands to the shape of part of another puzzle when placed in water.

4. An article of manufacture which comprises a solid article composed of a plurality of separate pieces of compressed, dehydrated, porous, hydrophilic sponge material, said pieces being joined together so that the junctions between said pieces are not readily apparent, said pieces being so constructed as to be capable of coming apart and expanding when said article is placed in water so as to assume shapes different from the initial shapes of said pieces.

5. An article of manufacture as defined in claim 4 wherein said pieces assume the shape of parts of a puzzle when said article is placed in water.

6. A toy puzzle which comprises a plurality of separate articles, each of said articles comprising a dehydrated body of a porous hydrophilic sponge material, said articles fitting together in a multi-dimensional puzzle, said articles being so constructed as to be capable of hydration in water so as to form parts of a multi-dimensional puzzle of a different shape.

7. A toy puzzle as defined in claim 6 wherein said articles are formed of compressed, regenerated cellulose and are substantially free from voids.

8. A toy puzzle as defined in claim 6 wherein said articles are colored differently.

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