

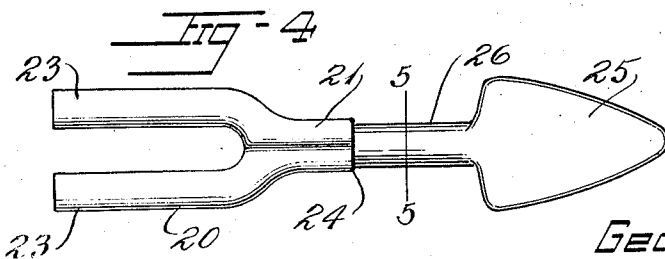
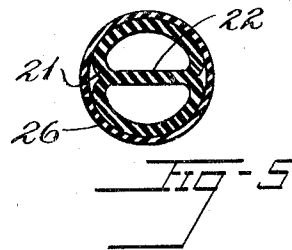
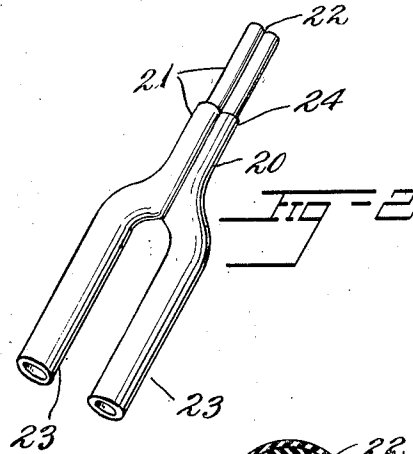
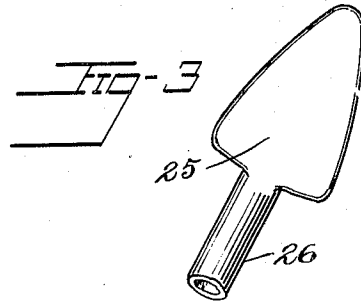
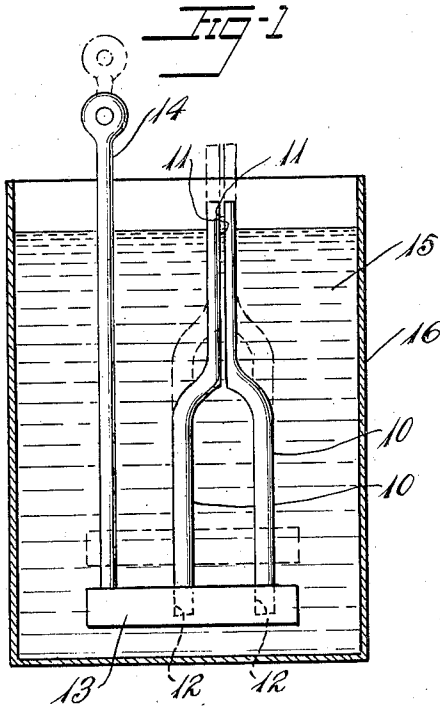
July 13, 1937.

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2,086,654

METHOD OF MAKING THERAPEUTICAL APPLIANCE

Original Filed March 28, 1934



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UNITED STATES PATENT OFFICE

2,086,654

METHOD OF MAKING THERAPEUTICAL APPLIANCE

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Original application March 28, 1934, Serial No. 717,763. Divided and this application February 11, 1935, Serial No. 5,953

11 Claims. (Cl. 18—59)

This invention relates to rubber articles of complicated structure particularly adapted for therapeutical use, such as articles internally divided into channels for the circulation of fluids therethrough, and to methods for making such articles.

A therapeutical treatment has been perfected which requires uniform application of controlled heat or cold to the mucous linings of certain natural bodily cavities. In the application of such treatment, a hollow flexible fluid-tight applicator is inserted into the bodily cavity to be treated and water or other fluid at a desired temperature is circulated through the applicator. For efficiency and uniformity of heat transfer, it is desirable that the water shall be caused to circulate throughout the applicator and that the walls of the applicator shall be thin and preferably somewhat elastic and distensible to provide for fitting the applicator to the irregularities of the cavity lining by distension of the applicator effected by internal fluid pressure. It is also necessary to provide compact means for conveying water or other fluid to and from the applicator. It is of course also essential that the appliance shall be of simple structure to permit easy and frequent cleaning and sterilization necessary as a consequence of the nature of service to which the appliance is put.

As a material for making such appliance, rubber meets the requirements as to fluid impermeability, elasticity, flexibility, sanitary qualities, etc., but ordinary methods of rubber manufacture are not adapted to produce the unusual, frequently small, and somewhat complicated structures required in appliances which must conform in shape to natural bodily cavities such as for example the small tubular nasal and ear passages, the urethra, etc., and which at the same time must be constructed to provide for the circulation of water through all parts thereof.

Accordingly the chief objects of this invention are to provide an efficient and economical method of making rubber articles of complicated and unusual structure of the type indicated above, and to provide a rubber article particularly adapted for therapeutical use embodying novel constructional features. Other objects will be apparent from the following description of the invention as applied to the manufacture of an article useful as a therapeutical appliance.

Of the accompanying drawing,

Fig. 1 is an elevation partially in section, showing an assembled form suitable for use in manufacturing articles according to a method of the

present invention, the form being immersed in a liquid dispersion of rubber.

Fig. 2 is a perspective view of a part of an article, made upon the form of Fig. 1.

Fig. 3 is a perspective view of another part of the article.

Fig. 4 is an elevation of the finished rubber article.

Fig. 5 is a vertical section taken on line 5—5 of Fig. 4.

As an illustration of the method of the present invention, I will describe the manufacture of a therapeutical appliance having an enlarged or bulbous applicator portion to which circulating fluid may be supplied by means of a divided or channeled tubular connecting stem and a pair of integrally formed connecting tubes, all of novel construction. In the manufacture of such an appliance I preferably prepare two separate parts of the finished article and thereafter unite the two parts in a manner hereinafter to be more fully described. To prepare the first of the two parts, I provide a pair of similar mating rod-like forming members 10, 10, each preferably having a flat area or face 11, 11, extending longitudinally of the member for a substantial distance from an end thereof. Each of the rod-like members also is preferably bent into an ogee curve in a direction away from the flat area, the curve beginning at the margin of the aforesaid flat area removed from the end of the member. The two members then are mounted in mating relation with their flat areas or faces in parallel face-to-face but slightly spaced apart relationship and with the curved portions of the members diverging, as by inserting the ends of the members removed from the flat areas in suitably spaced holes 12, 12, in a rectangular bar 13 supported by a handle 14. The assembled form, preferably with the free ends of the forming members pointing upward, then is immersed to a point near the ends of the members in a liquid dispersion of rubber 15 such as compounded natural rubber latex contained in a tank 16, and a coating of rubber is deposited upon the forming members and between the flat areas thereof, either by simply dipping the form into the dispersion one or more times or by accelerating the normal deposition using any of the well known methods of accomplishing such results. Then, preferably, although not in all cases necessarily, the form is raised (as indicated by the dotted outline in Fig. 1) until the liquid level of the dispersion strikes the form at a point about half way between the free ends of the forming members and the point

of convergence of the bent members, and the deposition is continued, or the lower portion of the form may be redipped several times, to build up on the lower or diverging portions of the forming members a coating of rubber considerably heavier than the initial coating covering substantially the entire form. Preferably the dipping operations are executed with care to provide a shoulder at the line of division between the thinner and thicker portions of the deposit. The deposited rubber then is dried and preferably is vulcanized partially to a degree which will permit of considerable flexing without acquiring a permanent distortion but not to a degree which will entirely remove its adhesiveness, after which the dried and partially vulcanized rubber is cut around the forming members at a point just above the supporting bar, and the separate forming members are stripped from within the rubber. A short length of the double-channeled tubular portion of the rubber may be cut off if necessary to provide a clean-cut end. Thus there is produced a component part or member 23 of the desired article, this part consisting of a relatively rigid but still somewhat flexible tubular stem 21 divided by an internal web 22 into two parallel channels which diverge at one end to provide a pair of connecting tubes 23, 23. The diverging connecting tubes and the adjacent end of the channeled tubular stem are considerably heavier than the open end of the stem, the lighter and heavier portions meeting to form a shoulder 24 about midway of the length of the double channeled stem.

A second component part or member of the desired article then is separately made by immersing a suitably shaped form into a liquid dispersion or rubber, drying and partially vulcanizing the rubber and stripping it from the form. Such part, for example, may consist of a relatively thin walled hollow bulbous applicator 25 having a constricted tubular neck 26 adapted to fit closely over the smaller portion of the stem 21, the tubular neck 26 being substantially the same length as the distance from the shoulder 24 to the free end of stem 21. The two prepared parts then are associated as by slipping the tubular neck of the bulbous applicator over the stem until the end of the neck is against the shoulder on the stem, and adhering the two parts together, preferably by immersing the assembled appliance in a liquid dispersion of rubber to provide thereover an enveloping thin coating of rubber uniting the two parts into an integral whole, although other means of adhering the two parts together of course may be used as for example by applying a suitable adhesive between contiguous surfaces of the two parts. Finally the appliance is dried and vulcanization of the rubber is completed to provide a finished therapeutical appliance as illustrated in Fig. 4. If the portions of the two parts to be united as in the preceding example, are of substantially equal size and relatively heavy wall thickness, a butt joint between the two may be made and reinforced, if necessary, by an overlying enveloping coating of rubber as described.

Thus, it will be seen that I have provided a simple, economical and readily executed method of making articles of unusually complicated structures such as are required in therapeutical appliances of the type described, although the method is by no means limited to the manufacture of such appliances and may be used in making arti-

cles for many different purposes where similar structures are required.

It is also apparent that I have produced an all-rubber article especially useful as a therapeutical appliance and which is of novel construction providing relatively rigid and non-extensible connecting tubes and channeled stem leading to a relatively thin and somewhat distensible applicator portion. The double channeled stem extending to the margin of the bulbous portion assures excellent circulation of fluid to and from the applicator to maintain a desired uniform temperature in the applicator, and the provision of integral connecting tubes eliminates cumbersome and inconvenient connections necessary in prior appliances, while the compact all-rubber construction provides ease of manipulation and permits frequent repeated sterilizations without inconvenience.

The term "liquid dispersion of rubber" has been used in a broad sense to include flowable dispersions of caoutchouc, balata, gutta percha, synthetic rubber, and like materials, whether dispersed in an aqueous vehicle as in natural latex and in artificial aqueous dispersions, or in a non-aqueous rubber solvent vehicle as in rubber cements. The dispersions may be concentrated, diluted, thickened, thinned or otherwise preliminarily treated and may contain any desirable compounding ingredients such as fillers, pigments, vulcanizing agents, age-resistors, etc.

Modifications and variations may be made in details of the article, procedure, and apparatus hereinabove described without departing from the spirit and scope of the invention as defined by the appended claims.

This application is a division of my co-pending application Serial No. 717,763 filed March 28, 1934.

I claim:

1. The method of making an essentially integral all-rubber article of the type described which comprises forming by deposition from a liquid dispersion of rubber a double-channeled tubular rubber stem, separately forming by deposition from a liquid dispersion of rubber an applicator having a tubular neck, inserting the stem into the neck, and coating substantially the entire assembled article with a liquid dispersion of rubber, and drying the dispersion to provide an enveloping coating of rubber uniting the two parts into an essentially integral structure.

2. The method of making an essentially integral all-rubber article which comprises forming a part of the article having a tubular stem, separately forming a second part of the article having a tubular neck adapted to be associated with said stem, associating the neck with the stem to provide a fluid channel extending from one of said parts to the other, and uniting the two parts into an essentially integral structure by coating a substantial part of the assembled article including the joinder of the neck and stem with a liquid dispersion of rubber and drying the dispersion.

3. A method as defined by claim 2 in which the assembled article is coated by immersing it in the liquid dispersion of rubber.

4. The method of making a rubber article of the type described which comprises preparing a plurality of similar separate rod-like forming members, mounting the members in parallel slightly spaced apart relationship, filling the open space between and coating the members with a liquid dispersion of rubber, drying the dispersion

and stripping the members from within the dried rubber, to provide a tubular rubber stem divided by an integral web into a plurality of channels, associating the neck of a separately formed second rubber part with said tubular stem, and adhering the two parts together to produce an integral rubber article.

5. A method as defined by claim 4 in which the two parts are united by coating substantially the entire assembled article with a liquid dispersion of rubber, and drying the dispersion.

6. The method of making a rubber article having a hollow bulbous portion and double-channeled integral tube connected therewith, which comprises preparing two similar separate rods each shaped to form a single channel, mounting the rods in parallel slightly spaced apart relationship, filling the open space between and coating the rods with a liquid dispersion of rubber, drying the dispersion and stripping the rods from within the dried rubber to provide a tubular stem divided by an integral web into two parallel channels, separately preparing a hollow bulbous rubber part having a constricted neck adapted to fit over said tubular stem, inserting the stem into the neck, and adhering the two together to provide an integral rubber article of the desired structure.

7. A method as defined in claim 6 in which the neck of the bulbous part and the tubular stem are permanently united by coating substantially the entire assembled article with a liquid dispersion of rubber, and drying the dispersion.

8. The method of making a rubber article of the type described which comprises preparing a plurality of similar separate rod-like forming members, mounting the members in parallel slightly spaced apart relationship, filling the open space between and coating the members with a liquid dispersion of rubber, drying the dispersion, vulcanizing the resulting rubber partially to an extent which will permit of considerable flexure without acquiring a permanent distortion

but not enough to remove entirely the adhesiveness of the rubber, stripping the forming members from within the dried and partially vulcanized rubber, thereby to provide a tubular rubber stem divided by an integral web into a plurality of channels, associating the neck of a separately formed second rubber part with said tubular stem, permanently adhering the two together to produce an essentially integral rubber article, and thereafter completing vulcanization of the rubber.

9. A method as defined by claim 8 in which the second rubber part also is partially vulcanized at the time it is associated with the tubular stem.

10. The method of making a rubber article having a complicated hollow structure preventing formation of the complete integral article by ordinary methods, which comprises separately forming at least two component rubber parts designed upon assembly to constitute the final article, assembling the parts in proper relation, coating a substantial part of the assembled article including the joinder of the parts with a liquid dispersion of rubber and drying the dispersion to provide an enveloping coating of rubber uniting the parts into an essentially integral hollow structure.

11. The method of making a rubber article having a complicated hollow structure preventing formation of a complete integral article by ordinary methods, which comprises separately forming at least two component rubber parts designed upon assembly to constitute the final article, the formation of at least one of the two parts being effected by deposition of rubber from an aqueous dispersion, assembling the parts in proper relation, coating substantially the entire assembled article with an aqueous dispersion of rubber, and drying the dispersion to provide an enveloping coating of rubber uniting the parts into an essentially integral structure.

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