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METHOD FOR WASHING SPONGY MATERIAL

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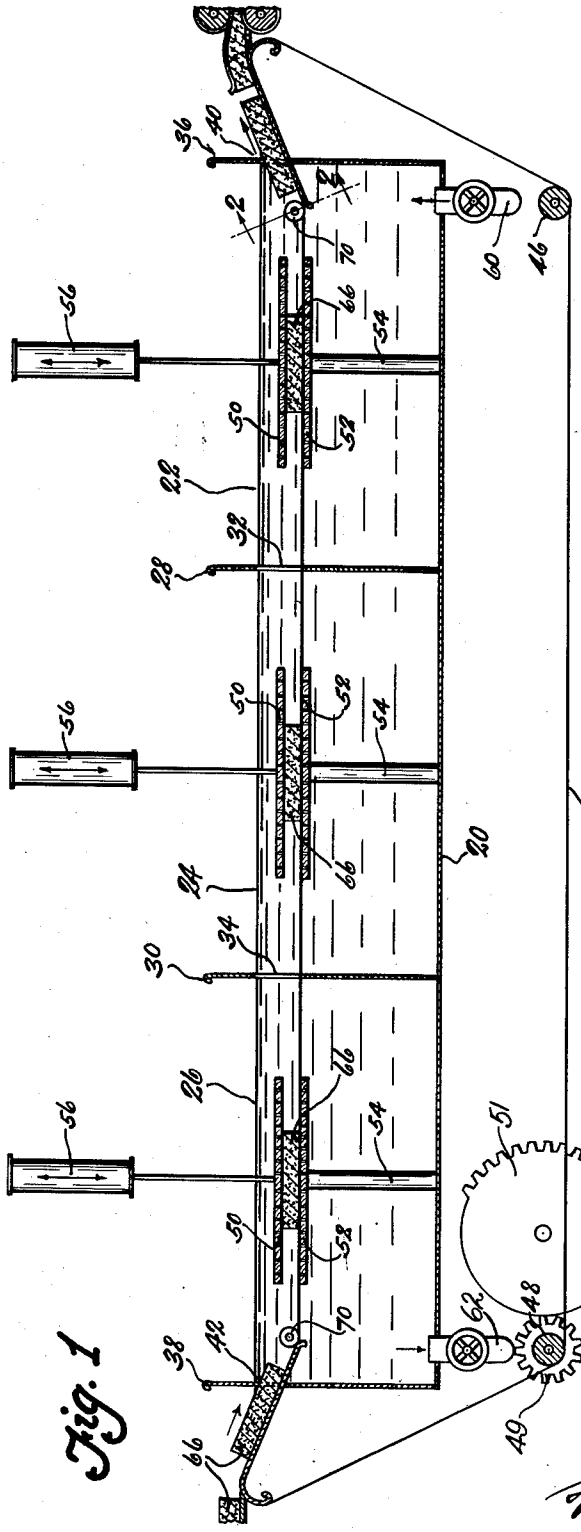


Fig. 1

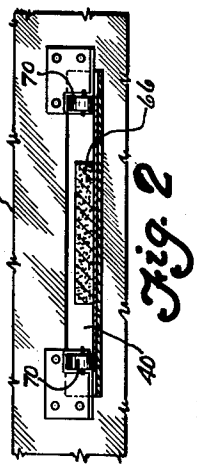


Fig. 2



Fig. 4

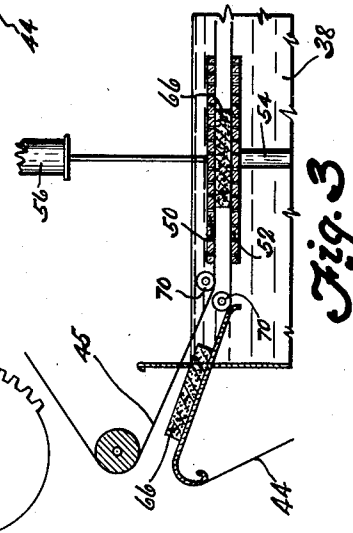


Fig. 3

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# UNITED STATES PATENT OFFICE

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## METHOD FOR WASHING SPONGY MATERIAL

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4 Claims. (Cl. 134—9)

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This invention relates to washing machines and is particularly directed to processes for washing spongy resilient materials and the like.

It is therefore an object of the invention to provide a method for washing spongy resilient material, such as sponge made from foamed latices or from chemically blown rubbers, etc.

A further object of the invention is to provide a washing method wherein the spongy resilient material is progressively washed at a series of stations for removing soluble ingredients therein.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawing, wherein preferred embodiments of the present invention are clearly shown.

In the drawing:

Fig. 1 is a view in section of one type of washing apparatus which may be used satisfactorily for washing spongy resilient material.

Fig. 2 is a section taken on line 2—2 of Fig. 1.

Fig. 3 is a partial sectional view of another design of apparatus.

Fig. 4 shows one type of securing means which may be used to locate and hold articles to the belt.

Spongy resilient material as defined herein may include resilient plastic sponges, sponge from latex foam, sponge from chemically blown rubber-like material, such as, natural rubber, reclaimed rubber and synthetic rubber which may include butadiene-styrene copolymers, butadiene-acrylonitrile copolymers, polychloroprene mixtures of any of the foregoing and in fact, any material which is spongy and resilient in character.

In the manufacture of most sponges, soaps or other materials are used in the compounding which are not desirable in the sponge after formation and during use thereof. It is highly desirable in this case to remove these undesirable soluble materials from the sponge so that the sponge is clean and free from any material which may have a deleterious effect thereon over long periods of time during use.

Numerous expedients have been proposed for washing sponges. Most of these expedients utilize wringers in series and are extremely expensive and require large installations of equipment and machinery. The present method and apparatus is directed to a facile solution of the problem wherein the sponge is washed properly in a continuous process and wherein the equipment is inexpensive, compact and readily set up.

Referring particularly to Fig. 1, a tank 20 is

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shown which preferably includes three compartments 22, 24 and 26 separated by walls 28 and 30. The walls 28 and 30 have apertures 32 and 34 therein respectively. The ends of the tank, as shown at 36, 38, also have apertures therein, namely 40 and 42. An endless conveyor belt 44 is provided which is preferably perforated or made of permeable material and passes through the apertures 42, 34, 32 and 40 and around rollers or cogs 46 and 48 which may be used to power the device through attachment with a suitable motor. The belt 44 also passes between three similar pairs of perforated plates 50 and 52. The plates 52 are maintained in position within the tank 20 on standards 54 while the plates 50 are attached to suitable reciprocating mechanisms 56 which may be driven by any suitable means such as a motor attached to a cam, hydraulically operated cylinders and the like. Water is supplied to the tank 20 through an inlet 60 and is drawn off through an outlet 62. The outlet 62 preferably includes a pump, not shown. Thus, water flows into the first compartment 22 through the aperture 32 into compartment 24 through aperture 34 into compartment 26 and thence through outlet 62 to the waste. Sponge articles 66 are progressively fed upon the belt 44 and are moved into the tank thereby. The belt driving device is so adjusted that as a sponge article reaches the position shown in tank 26, the belt stops for a predetermined period of time whereupon the reciprocating device 56 operates to alternately squeeze and release the sponge under water and between plates 50 and 52. After a predetermined time of reciprocation, the plates 50 are maintained raised in position and the belt moves a distance sufficient to bring said spongy article under the second reciprocating device, while moving another article into the first position, etc. A diagrammatic showing of a means for intermittently moving the belt is shown in connection with the roller 48, which roller is connected to a gear 49 which is engageable with a second gear 51. The gear 51 is driven by the motor. It will be noted that the gear 51 only includes teeth on a portion of its periphery, the size of the two gears 49 and 51 and the extent of the teeth on gear 51 being regulated so as to move the belt only the desired distance between washing stations and to permit the belt to remain stationary at each washing station a desired period. It is apparent that any other suitable means may be used for this purpose, such as slip clutches, intermittently operated clutches or electrically operated magnetic clutches, and the like, the mecha-

nism shown being one of the many ways of accomplishing the movement desired.

In this manner, each spongy article is washed through alternate compression and release three times in progressively cleaner water, since the water in tank 22 is fresh water while the water in tank 26 has the highest concentration of soluble ingredients therein. It is apparent that if more complete washing is desired, four or five or any number of tanks may be used wherein the flow of water is countercurrent to the washing operation.

After the sponge article passes the final station, it emerges from the wash tank and passes between a pair of pressure rollers 68 wherein it is squeezed to remove excess water which runs back into the tank.

Fig. 2 shows the design of the tank at the inlet and outlet thereof where a pair of rollers 70 are used on each side of the belt 44 to permit upward bending of the belt 44. It is apparent that the apparatus, as shown in the invention, is simple to construct and operate and provides a continuous equipment for washing sponge articles. In all cases, the alternate squeezing and releasing of the article may be carried out at different rates of reciprocation in order to obtain the best results compatible with the thickness of the article being washed. Preferably we prefer to squeeze the article and release the same at a rate varying from ten to forty times a minute, although this figure is in no way limiting since it is apparent that on very thick articles, the rate may have to be slower for satisfactory operation and on very thin articles it may be desirable to even use a more rapid reciprocation. Another controlling factor of this rate is the porosity or sponginess of the article. Coarse sponges are more adapted to rapid reciprocation than are fine, small pored sponges and all of these factors must be considered when setting up the apparatus. In any event, the squeezing rate is not of any great importance provided effective washing is obtained and for this reason, it is best to arrive at said rate by trial for a specific article or articles to be washed. Obviously, fewer articles can be washed in a given apparatus at a slow rate than at a fast rate and therefore, it is apparent that the faster the rate, the more productive the apparatus will be, but again, this rate is governed to some extent by thickness, pore size and the like.

It is also within the scope of this invention to utilize a single tank with no partitions, providing the flow of washing fluid is sufficiently fast to carry off the soluble ingredients and thereby permit satisfactory washing. The use of the partitions in the preferred embodiment is to maintain segregated bodies of washing fluid having progressively greater quantities of the soluble ingredients therein, but it is manifest that if the flow of fluid is sufficiently great, these partitions are unnecessary. Obviously, the greater the flow, the more fluid is required and therefore economics enter into the specific design. It is further apparent that the pressure devices or plattens may be reversed so that the bottom platten reciprocates while the upper platten is stationary or both plattens may reciprocate. Any of these modifications are clearly within the scope of the invention.

Fig. 3 shows a modification of the belt design wherein two belts 44 and 45 are used which are



disposed above and below the article to be washed. The belts are synchronized in movement and maintain the articles in position. In all embodiments, that is, either the single-belt or the two-belt type, the spongy articles may be secured to the belt to prevent displacement by any suitable means, one of which is shown in Fig. 4 at 51, where a spring clip is secured to the belt under which a portion of the spongy article may be held and which is automatically released as the clip goes around the final roller. In most cases, securing means are unnecessary although with very low density sponges it may be advantageous to provide such expedients.

While the embodiments of the present invention as herein disclosed, constitute preferred forms, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

What is claimed is as follows:

1. A step-by-step process for removing soluble ingredients from spongy resilient articles, comprising the steps of, progressively advancing an article to be washed through a plurality of washing stations after a predetermined time delay at each station, alternately rapidly squeezing and releasing said article during each time delay and continuously flowing water in a direction countercurrent to the advancement of the article in quantities sufficient and of sufficient depth to at least submerge the article during each period of time delay for effecting a washing of the article.

2. The method as claimed in claim 1 including the added step of squeezing the water out of the article as it emerges from the last washing station.

3. In a continuous washing process for sponge rubber-like articles, the steps comprising, progressively conveying a sponge rubber-like article through a plurality of washing stations after a predetermined time delay at each station, washing the article by reciprocating the same during each time delay through alternate pressure and release, flowing washing water countercurrent to the direction of conveying the article in quantities sufficient and of sufficient depth to submerge the article at least during said washing periods for removing soluble materials from the article.

4. The method claimed in claim 3 wherein the sponge rubber-like article is squeezed to remove water therefrom as it emerges from the last washing station.

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