Sept. 9, 1952 J. T. MARVIN ET AL 2,609,826

APPARATUS FOR WASHING SPONGY MATERIAL

Original Filed March 3, 1948 2 SHEETS—SHEET 1

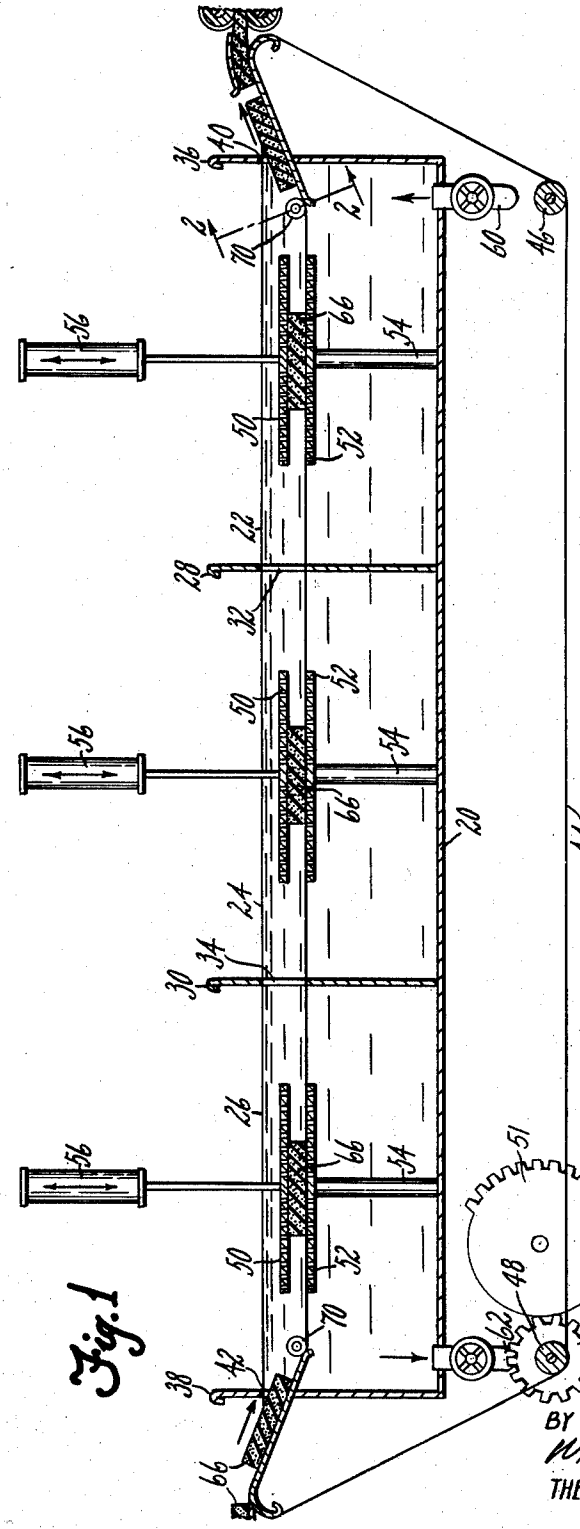


Fig. 1

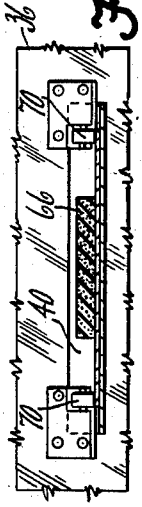


Fig. 2

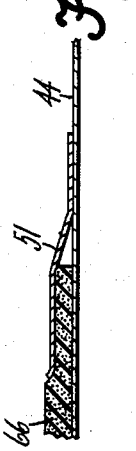


Fig. 4

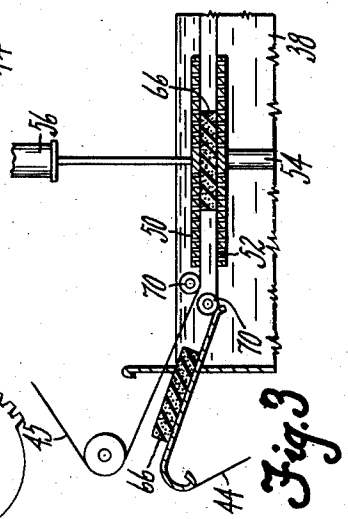


Fig. 3

INVENTORS
JOHN T. MARVIN
GEORGE H. McFADDEN
BY
Willis, Hardman & Fehr
THEIR ATTORNEYS

Sept. 9, 1952 J. T. MARVIN ET AL 2,609,826

APPARATUS FOR WASHING SPONGY MATERIAL

Original Filed March 3, 1948 2 SHEETS—SHEET 2

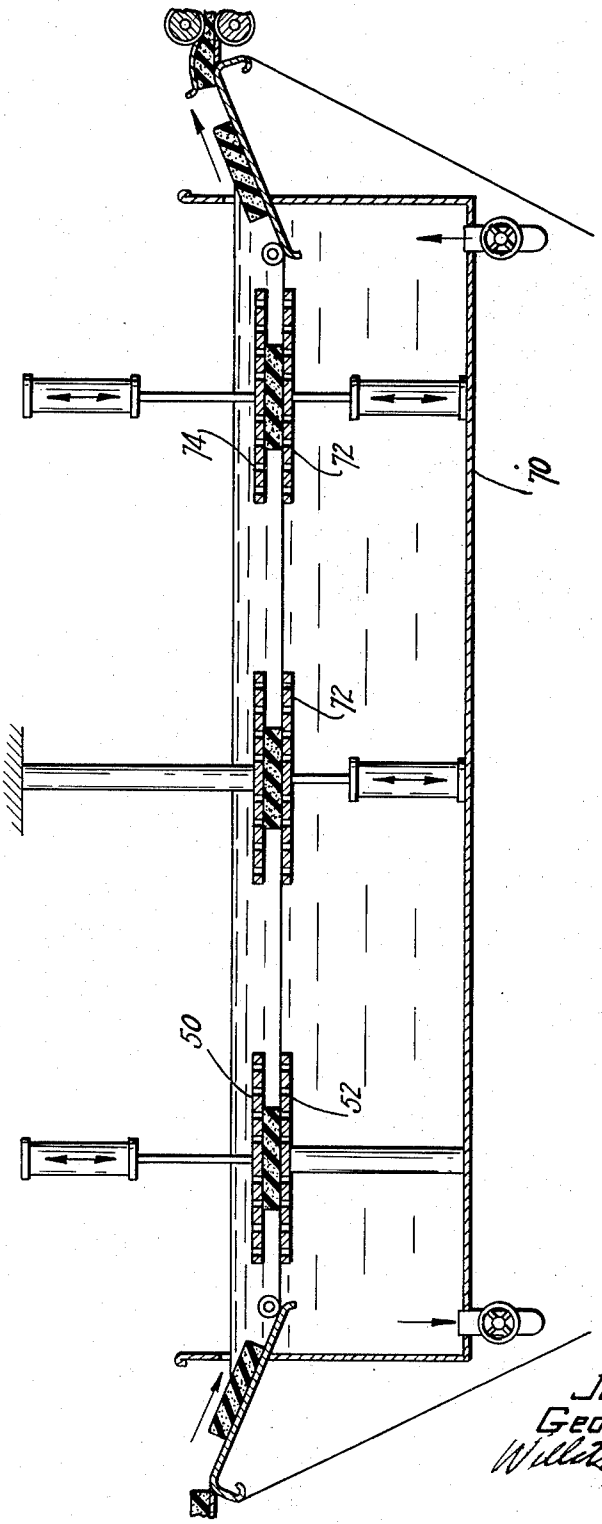



Fig. 5.

INVENTORS
John T. Marvin
George H. McFadden
Willis, Hardman & Felix
their Attorneys

Patented Sept. 9, 1952 2,609,826

# UNITED STATES PATENT OFFICE

2,609,826

## APPARATUS FOR WASHING SPONGY MATERIAL

John T. Marvin, Dayton, and George H. McFadden, Columbus, Ohio, assignors, by direct and mesne assignments, to General Motors Corporation, Detroit, Mich., a corporation of Delaware

Original application March 3, 1948, Serial No. 12,706. Divided and this application April 8, 1950, Serial No. 154,788

3 Claims. (Cl. 134—60)

1

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

This invention is a division of our copending application, Serial No. 12,706, filed March 3, 1948, for a method for washing spongy material.

It is therefore an object of the invention to provide an apparatus 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 machine 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.

Fig. 5 is a view showing other embodiments of the invention in cross section.

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 aforegoing 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 apparatus is directed to a facile solution of the problem wherein the sponge is washed properly in a continuous manner and wherein the equipment is inexpensive, compact and readily set up.

2

Referring particularly to Fig. 1, a tank 20 is 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. The diagrammatic showing of a means for intermittently moving the conveyor 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 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 conveyor belt only and to the desired distance between washing stations and to permit the conveyor 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 mechanism 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 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 70 as shown in Fig. 5 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 72 reciprocates while the upper platten is stationary or both plattens 72 and 74 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.

What is claimed is as follows:

1. A machine for washing spongy resilient articles, comprising in combination; at least three interconnected tanks adapted to contain a washing fluid, an endless conveyor passing through said tanks and disposed beneath the level of said fluid, a pair of perforated plattens disposed in each tank beneath the level of the fluid and on either side of said conveyor, one of each of said pairs of plattens being stationary and the other being adapted for reciprocation toward and away from the first mentioned platten, means for intermittently advancing the conveyor to position the articles between oppositely disposed plattens and subsequently move the articles away therefrom whereby articles on said conveyor and between said plattens may be alternately compressed and released by said reciprocating platten, and means for causing a flow of the fluid in said tanks in a direction countercurrent to the direction of movement of said conveyor.

2. A machine for washing spongy resilient articles, comprising in combination; a tank adapted to contain a washing fluid, a conveyor passing through said tank and disposed so that at least a portion thereof is beneath the surface of said fluid, a pair of perforated plattens disposed on either side of said conveyor at the point where said conveyor is beneath the fluid, means for intermittently advancing the conveyor to position the articles between oppositely disposed plattens and subsequently move the articles away therefrom and means for moving at least one of said plattens toward and away from the other platten whereby articles on said conveyor and between said plattens are alternately compressed and released beneath said fluid.

3. A machine for washing spongy resilient articles, comprising in combination; a tank adapted to contain a washing fluid, a conveyor passing through said tank, a plurality of perforated pairs of plattens within said tank positioned so that the conveyor passes between each pair of plattens, means for moving the conveyor through the tank and for intermittently stopping the conveyor periodically so that the spongy articles thereon are stopped between re-

lated pairs of plattens, and means for causing each pair of plattens to move relatively to one another reciprocally for alternately squeezing and releasing an article therebetween, the said last means being effective each time the said first means stops the conveyor.

JOHN T. MARVIN.
GEORGE H. McFADDEN.


REFERENCES CITED

The following references are of record in the file of this patent:



UNITED STATES PATENTS

| Number | Name | Date |
|---|---|---|
| 419,932 | Ernst | Jan. 21, 1890 |
| 1,071,022 | Berger | Aug. 26, 1913 |
| 1,447,017 | Fleming | Feb. 27, 1923 |
| 2,209,950 | Nai | Aug. 6, 1940 |
| 2,239,636 | Weiss | Apr. 22, 1941 |