

[54] APPARATUS FOR TREATMENT OF CLOTH

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[30] Foreign Application Priority Data

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[57] ABSTRACT

[52] U.S. Cl. .... 68/177, 68/184

An apparatus for treatment of cloth comprises an inclined trough for liquid flow with spaced ridges along the bottom thereof to provide waves in the liquid. A cloth is spread out on the liquid and is floated downwardly on the flowing liquid under no tension and the cloth is treated by the massage action by the waves in the liquid.

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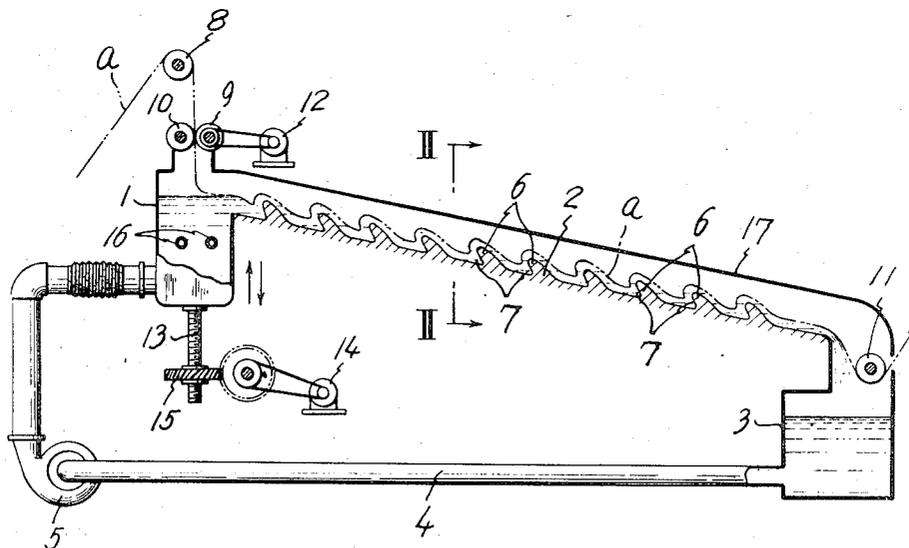
[58] Field of Search ..... 68/181 R, 184, 175, 68/177, 205 R; 8/151

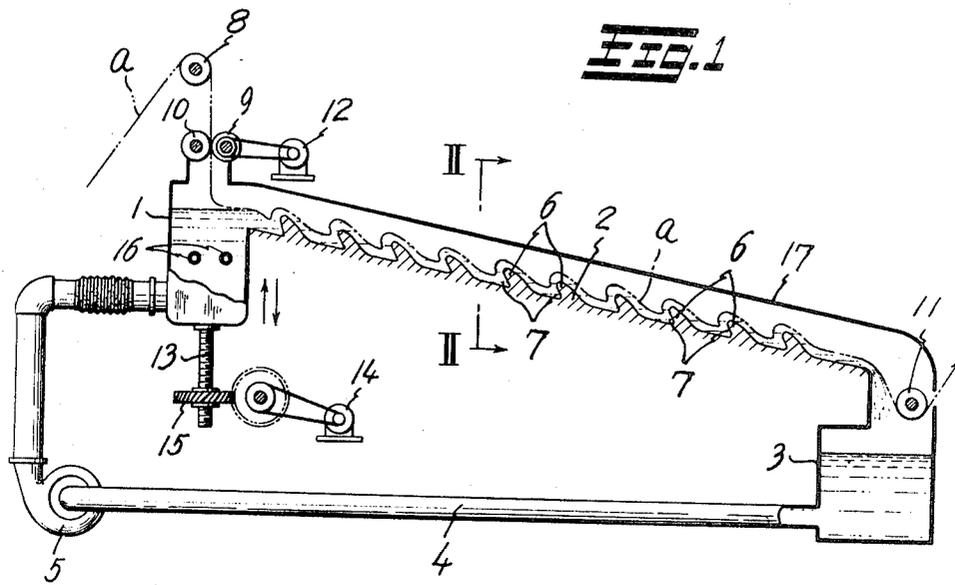
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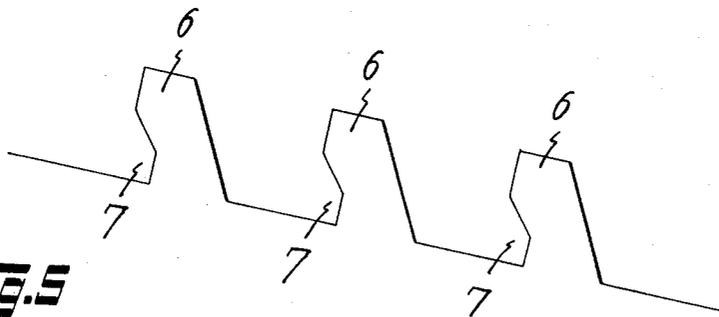
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7 Claims, 9 Drawing Figures

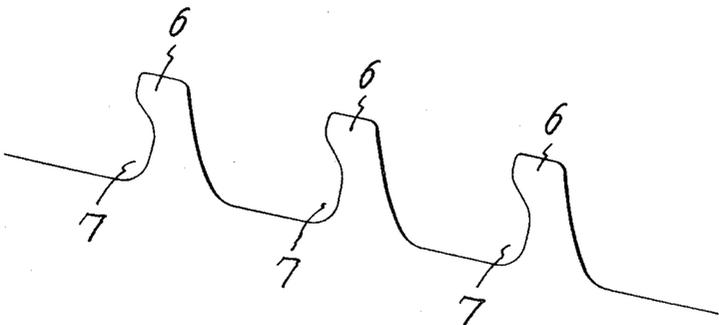




**FIG. 4**



**FIG. 5**



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FIG. 2

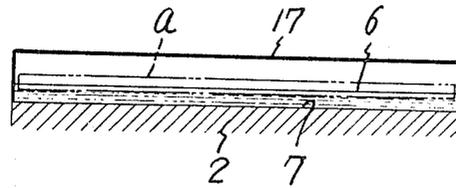
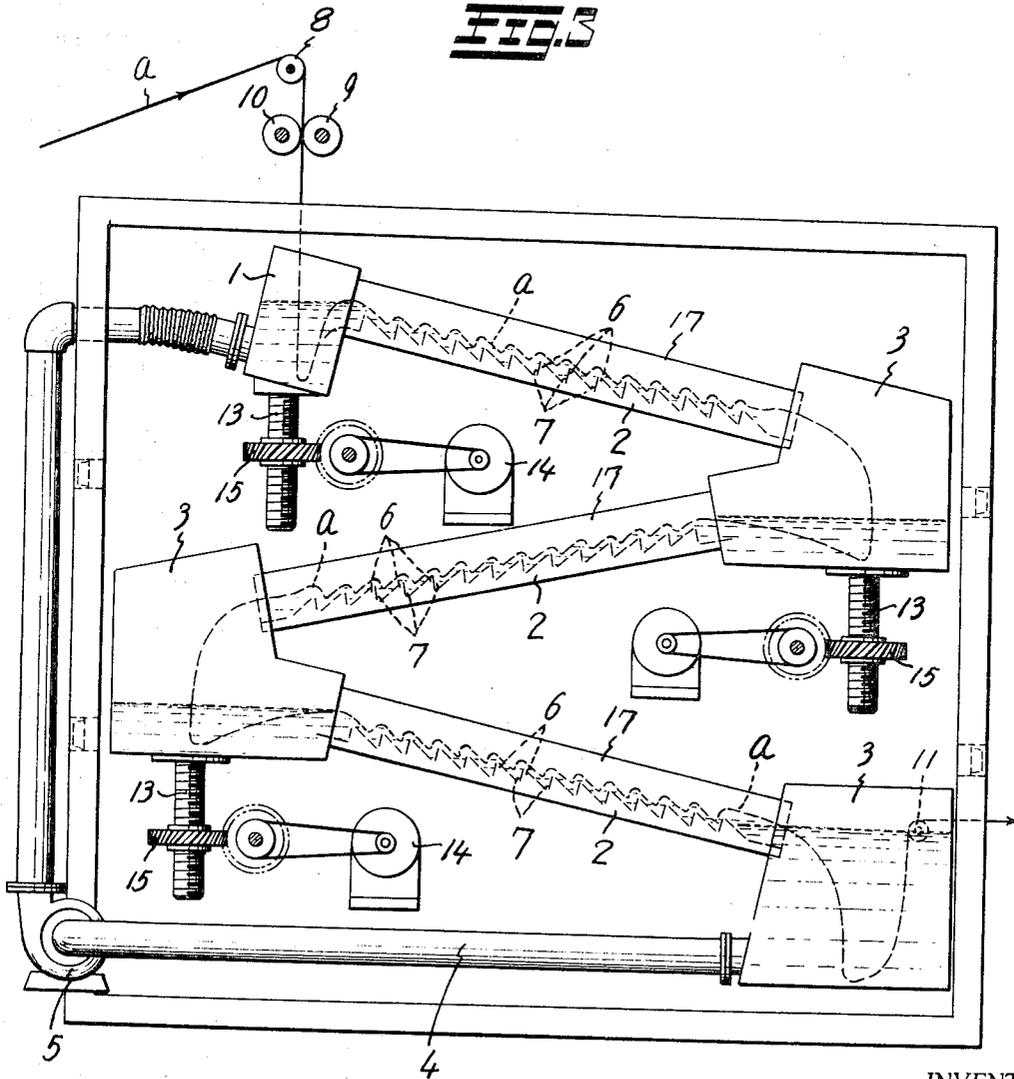
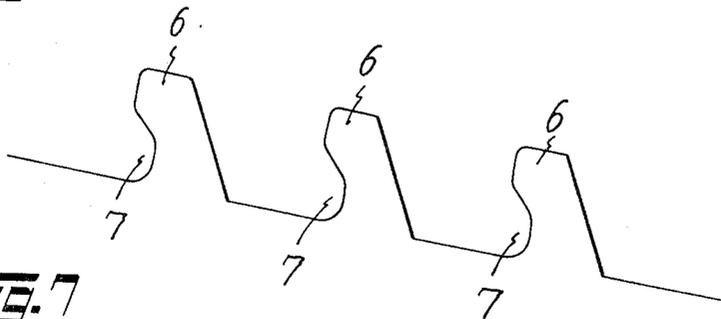


FIG. 5

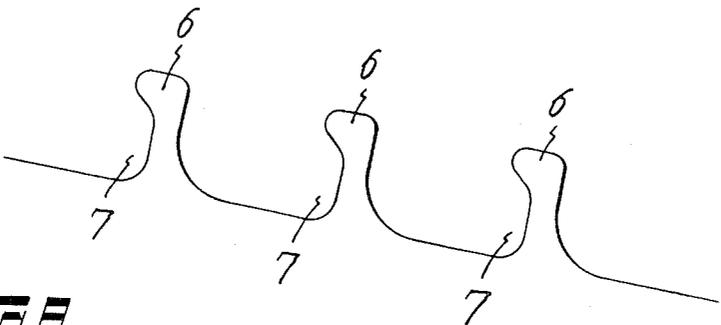


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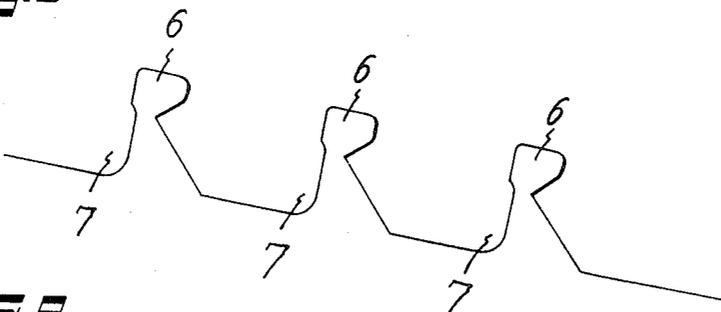
**FIG. 6**



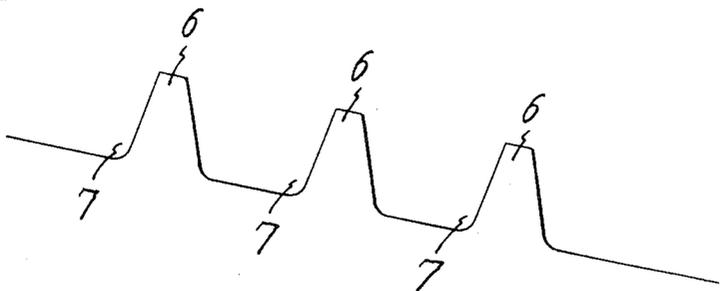
**FIG. 7**



**FIG. 8**



**FIG. 9**



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## APPARATUS FOR TREATMENT OF CLOTH

### BRIEF SUMMARY OF THE INVENTION

This invention relates to apparatus for effectively treating cloth with a liquid, such as, cleaning, de-sizing or the like in which a relaxation treatment is required, or said cloth is not suitable for being subjected to a tension.

According to the invention an inclined trough-shaped liquid flow channel has a bottom surface with spaced ridges thereon acting to resist downward flow of the liquid to cause the flowing liquid to produce waves so that a cloth to be treated can be floated along the liquid under no tension, the cloth being subjected to a toss and beat action by the liquid.

### BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a sectional side view of one embodiment according to this invention,

FIG. 2 is a sectional view taken along the line II—II in FIG. 1,

FIG. 3 is a sectional side view of another embodiment according to this invention, wherein the wave forming trough in FIG. 1 is formed in several stages, and

FIGS. 4 to 9 are sectional side views showing various types of wave forming troughs.

### DETAILED DESCRIPTION

Referring to the drawings, numeral 1 denotes a liquid tank, and numeral 2 denotes a trough extending from the tank. The trough 2 has an inclination with the horizontal and is connected at its lower end to a liquid receiving tank 3, so that under the head between the two tanks 1 and 3 the liquid within the liquid tank 1 is allowed to flow into the liquid receiving tank 3 through the trough 2. The liquid within the liquid receiving tank 3 is forced to return through a return flow pipe 4 to the liquid tank 1 by the operation of a pump 5 so that the liquid can be used repeatedly.

The trough 2 is somewhat wider than the width of a cloth *a* to be treated, and the bottom surface of trough 2 is provided in the longitudinal direction thereof with spaced ridges 6 each extending at right angles to the direction of liquid flow so as to oppose the liquid flow. Consequently, the flowing liquid impinges against the ridges 6 and thereby there is produced either an eddy flow, a turbulent flow, a laminar flow or the like causing the flowing liquid to form waves. Those waves may be altered as regards wave length, size, shape and condition of flow depending on the shape, height, width and spacing of the ridges 6. If the ridges 6 extend the entire width of the trough 2 as shown in FIG. 2, the waves will be uniform in the width direction of the cloth and thereby the cloth can be treated without being wrinkled.

FIGS. 4 to 9 show various shapes and arrangements of the ridges 6 on the trough 2. In general, each ridge 6 is inclined rearwards, i.e., opposite the direction of liquid flow, and has at its rear lower surface 7, to serve effectively to produce eddy flow and turbulent flow resulting from impact of the flowing liquid thereagainst. It is possible to make the wave large in size by making the height of the ridge 6 smaller than the spacing between adjacent ridges.

Thus, if the cloth *a* to be treated is fed into the liquid tank 1 from a guide roll 8 through feed rolls 9 and 10 and is then floated down along the liquid flow within

the trough 2, the cloth *a* is properly beaten by the waves and thus a toss and beat action or a massage action on the cloth *a* is effected during its downward floating travel and, thereafter, the cloth is removed through a guide roll 11.

Numeral 12 denotes an electric motor for driving the feed roll 9, and by adjusting the rotation of the feed roll 9, the feed speed of the cloth *a* is correlated with the downward floating speed thereof so that the cloth *a* can be treated without being subject to tension.

If, as shown in FIG. 3, the trough is constructed in several stages in series and with alternate directions of turns, i.e., in zig-zag form, the treatment may be repeated in succession and the top and bottom surfaces of the cloth alternately face the waves for being alternatively treated, whereby a uniform treatment of the surfaces can be effected. In this case, the liquid receiving tank 3 in the first stage serves also as the liquid supply tank for the second stage, and the liquid receiving tank 3 of the second stage serves also as the liquid supply tank for the third stage.

A supporting rod 13 supports the liquid tank from below and is in the form of a screw rod, and a gear 15 driven in rotation by a motor 14 meshes with the rod 13, so that by driving the gear 15, the liquid tank can be moved upwards and downwards, whereby the inclination of the trough 2 can be controlled and thereby the flow speed of the liquid can be adjusted. A heating tube 16 is placed in the liquid tank 1 so that the liquid within the tank 1 can be heated as occasion demands. If, as illustrated, the upper surface of the trough 2 is covered with a wall 17, the heat does not escape to the exterior and the liquid may be prevented from being cooled. If, additionally, the feed rolls 9 and 10 are arranged at the top of tank 1 as shown in FIG. 1 to close the liquid tank, they are also effective for heating the liquid and preventing heat loss.

Thus, according to this invention, a treating liquid at a suitable temperature flows downwardly in an inclined trough, and strikes against spaced ridges on the bottom surface of the trough, to produce eddy flow, turbulent flow, laminar flow or the like throughout the entire area of the interior of the trough to form waves in the flowing liquid, and a cloth to be treated is spread in its width direction and is floated downwardly along the upper surface of the liquid, whereby the cloth is tossed and beaten by the waves and an effective massage action on the cloth is effected. Thus any desired treatment such as cleaning, de-sizing or the like can be uniformly effected throughout the entire surface thereof. Since the cloth is not subject to any tension force, this massage action is effected in a complete tensionless state and thus an excellent relaxation treatment can be given.

What is claimed is:

1. Apparatus for treatment of cloth comprising a trough inclined with the horizontal for downward flow of liquid therein by gravity, a plurality of spaced ridges in said trough on the bottom thereof to form waves in the liquid during the downward flow thereof, and means for floating cloth on the liquid, without tension, along said trough to effect treatment of the cloth by massage action of the waves, said ridges extending across the entire width of the trough, said ridges defining a concave surface with the bottom of the trough.

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2. Apparatus as claimed in claim 1 wherein said ridges have a height less than the spacing between adjacent ridges.

3. Apparatus as claimed in claim 1 comprising means for heating the liquid before flow in the trough.

4. Apparatus as claimed in claim 1 comprising means for adjusting the inclination of said trough.

5. Apparatus for treatment of cloth comprising a trough inclined with the horizontal for downward flow of liquid therein by gravity, a plurality of spaced ridges in said trough on the bottom thereof to form waves in the liquid during the downward flow thereof, and means for floating cloth on the liquid, without tension, along said trough to effect treatment of the cloth by massage action of the waves, said trough including a succession of sections in series, the liquid flowing opposite directions in successive sections.

6. Apparatus as claimed in claim 5 wherein said means for floating the cloth along the trough reverses the direction of travel of the cloth in said successive

stages to cause opposite surfaces of the cloth to float on the liquid in successive stages.

7. Apparatus for treatment of cloth comprising a trough inclined with the horizontal for downward flow of liquid therein by gravity, a plurality of spaced ridges in said trough on the bottom thereof to form waves in the liquid during the downward flow thereof, means for floating cloth on the liquid, without tension, along said trough to effect treatment of the cloth by massage action of the waves, a liquid supply tank at the upper inlet end of the trough, a liquid receiving tank at the lower outlet end of the trough, means for recirculating the liquid from the receiving tank back to the supply tank to form a closed liquid circuit, said supply tank having an open top, and means for heating the liquid in said supply tank, said means for floating cloth on the liquid comprising feed rollers for said cloth at the top of said supply tank closing said open top to prevent heat loss.

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