

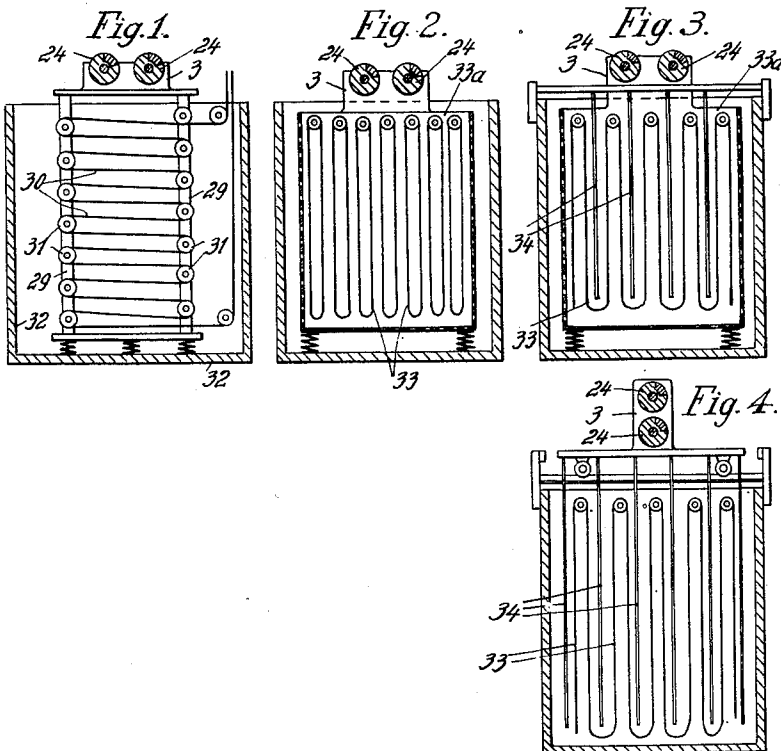
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DEVICE FOR AND METHOD OF TREATING FABRICS AND YARNS

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DEVICE FOR AND METHOD OF TREATING
FABRICS AND YARNS

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The present invention relates to a method for increasing the effect and speed of physical, chemical and biological processes which are impeded by the presence of a surface layer between the reacting substances. This desired effect I accomplish by rapid oscillation of one of the reacting substances so that the particles within the surface layer are kept in an oscillating condition which has the effect of reducing the thickness of the surface layer.

In all cases the more rapid the oscillations, the better this invention will be carried out until a certain optimum point will be reached above which the substances are strained beyond their elastic limits which tends to prevent the liquids or vapors escaping from the sphere of influence.

In other words, each particle should be considered as elastically oscillating separately and the amplitude and period of the oscillations should be kept below a point where undue intermingling of the particles will result.

Just what the proper period and amplitude of the oscillations should be cannot be more definitely stated since it varies widely, depending not only upon the substance being treated, but also upon the mass, resiliency, and temperature of the substances.

Generally, whenever there is any kind of a physical, chemical, or biological reaction between heterogeneous substances such as gases and liquids, gases and solids, or liquids and solids, the reaction will be hindered by a surface layer between the substances which has an insulating effect. To remove or diminish this surface layer is the object of my invention, and this I accomplish in two ways, as follows:

If it is practical I fasten an oscillator of well known design either directly to one of the reacting substances, or else to a frame adapted to carry the substance.

If it is not practical to oscillate the fluid directly in the above manner, it can be done under certain circumstances, which will be apparent to anyone skilled in the art, by means of wires stretched within the surface layer over which the fluid flows in passing. The wires vibrate as the fluid flows over them and these vibrations or oscillations are transferred to the surface layer.

In the drawing which illustrates specific embodiments of the invention:

Fig. 1 shows an oscillator employed in connection with a dyeing vat;

Fig. 2 is a modification of Fig. 1;

Fig. 3 shows an oscillator in connection with a drying device for fabrics;

Fig. 4 is a modification of Fig. 3.

The oscillator used in the present devices may be of any well known design, but usually consists of one or more revolving unbalanced cylinders or weights which impart a vibratory motion to anything connected to the oscillator.

In Figs. 1, 2, 3 and 4 are shown devices embodying this invention for the dyeing of yarn, fabrics or other webs. Referring to Fig. 1, a web 30 is run through the dyeing vat 32 by means of rollers 31 fastened to the frame 29. The frame 29 rests on springs or other resilient support and has an oscillator 3 attached to its top. Therefore, the speed of the dyeing operation will be increased because of the oscillations transferred to the surface layer on the web by means of the frame 29 and rollers 31. The device in Fig. 2 is similar, but here skeins of yarn 33 are hung on hooks which are fastened to frame 33a which is connected to the oscillator 3.

In Figs. 3 and 4 is disclosed a method of drying fabrics consisting in hanging the fabric 33 over rollers or bars and interposing plates 34 between the folds or loops of the fabric, the plates 34 being connected to an oscillator 3. The oscillation of these plates in close proximity to the fabric sets up oscillations in the surface layer around the fabric and accomplishes rapid drying.

In all of the above embodiments it will be noticed that the oscillations are conducted to the surface layer either by connecting the oscillating means directly to one of the reactive substances or by interposing some transmission means between the oscillator and the reactive substance.

The high frequency vibration causes the dye to penetrate to the interior of the cop and to give a uniform color to all parts of the yarn, whether the parts are exposed or not.

It will be understood that the above described embodiments of this process are merely descriptive of the manner in which the process is carried out and are not to be construed as limiting the invention to those specific uses. It being obvious that this invention can be employed to cause more intense reactivity between any heterogeneous substances as has been disclosed previously.

For the application of the method according to the invention on the basis of the statements made in the preceding description, it suffices to follow the directions given therein, which state that the oscillation velocity of the particles shall be as large as possible, but not too large so as to exceed the elastic limit, i. e., not large enough for the particles to undergo a permanent change

of their positions. It is not necessary to explain to the expert how large the velocity should be in millimeters per second, and it is not necessary to state numerically how large the frequency per second should be and how large the amplitude measured in millimeters should be; but as it is done in so many physical and chemical methods applied in practice, it must and should be up to the expert, first of all, to determine by experiments in every case what amount of energy and intensity and what frequency is necessary to produce the shocks required for the generation of the oscillations in order to obtain the desired effect, i. e., the increase in speed of the particles influencing each other as a result of the oscillations of the particles. The amount and the intensity of the energy and the frequency of the required shocks is governed by the kind and the nature of the material to be treated, as well as by its temperature for the time being, and it is self evident for the expert that by experimenting with slowly increasing energy, as well as slowly increasing frequency of the shocks, and by simultaneous observation of the result, i. e., by taking samples, it can and must be determined and ascertained what amount of energy and intensity and what kind of frequency for the shocks in a given case are necessary and sufficient to produce the desired result, i. e., the oscillation speed, frequency and the amplitudes of the oscillations necessary for the increase of the action of the particles amongst themselves, and in an analogous manner it can and must be determined and ascertained where the limit is which should not be exceeded; in other words, what amount of energy is employed thereby, what amount of intensity and frequency of the shocks to which the particles are subjected shall not be overstepped; or otherwise the desired result of the method would not be attained.

If an oscillator or vibrator is employed, the frequency of which shall be regulated without steps, one starts with the lowest frequency; if the amplitude of an oscillator shall be regulated without steps, one starts with the smallest amplitude.

If systems in closed containers shall be treated, so that the movement of the particles cannot be seen, a laboratory test in a small scale model is made and the frequency and amplitude necessary for the actual treatment is calculated from this small scale test. This can be done all the

time, because the flows which appear with these processes are governed by the law of mechanical similarities.

The following test shall be described as a working example:

Dyeing of cops of yarn (spindleful of yarn)

An accumulator glass container of 35 centimeter length, 23 centimeter width and 25 centimeter height was used for this test. The glue, or cinder paste, was removed from the cops with soda, the cops were 20 centimeters long and had a circumference of 15 centimeters in the middle. Citocol, Bordeaux red 2, was used as the dyeing agent. It was dissolved according to instructions, strained through linen cloth and diluted with 5 liters water with a temperature of 30° centigrade.

2 cops were lying on the bottom of the container, a pestle made of iron plate was provided above the cops; it was covered on its bottom part with a felt layer 1.5 centimeters thick and its width and length were equal to the width and length of the two cops together. The upper part of the pestle was rigidly connected with an iron beam which supported the oscillator vibrator. For comparison, another cop was in the same dye liquid, but not below the pestle. The oscillator made 1,000 revolutions per minute, and the amplitude of the pestle was 1.5 millimeters. After a quarter of an hour 10 grams of common salt were added. After the oscillator was in operation for half an hour, all the cops were cut in half. The cops below the pestle were completely dyed, while the other cop was dyed only on its surface. The threads were neither matted nor roughed.

Having described my invention, what I claim as new and useful and desire to protect by Letters Patent is:

1. A device for treating fabrics consisting of a tank, a rack resiliently mounted within the said tank to carry the said fabrics, said rack being connected to an oscillating means.

2. The method of expediting the dyeing of cops of yarn which comprises submerging the cops of yarn in a dye solution in a container and subjecting the cops to high frequency oscillations, whereby the dye penetrates to all parts of the cops to effect a uniform dyeing of the cops in a minimum space of time.

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