May 31, 1949. G. KUHN 2,471,876

CLOTHES WASHING AND CLEANING MACHINE

Original Filed Oct. 17, 1936

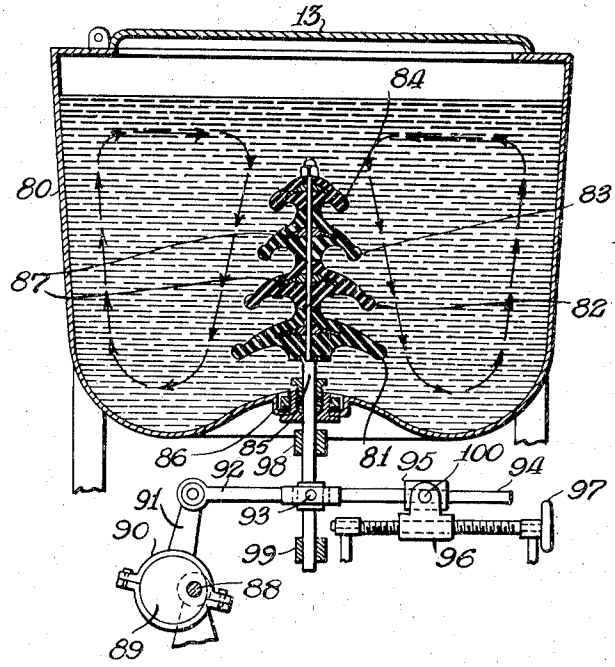


Fig. 1.

Fig. 2.

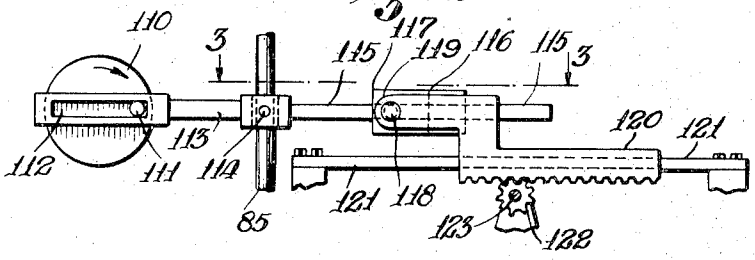
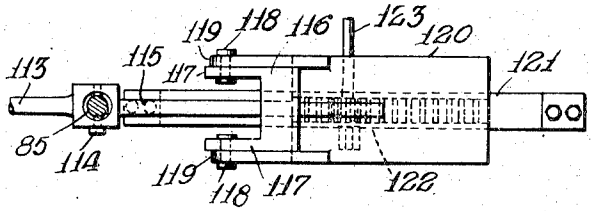


Fig. 3.



Inventor:
George Kuhn,
by Spencer Hardman & Fehr
Attorneys.

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UNITED STATES PATENT OFFICE

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CLOTHES-WASHING AND CLEANING MACHINE

George Kuhn, Silver Spring, Md., assignor to General Motors Corporation, Dayton, Ohio, a corporation of Delaware

Original application October 17, 1936, Serial No. 106,080. Divided and this application May 11, 1942, Serial No. 442,640

2 Claims. (Cl. 68—131)

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This invention relates to the washing and cleaning of fabrics and articles and more particularly to power driven washing and cleaning machines.

This application is a division of my copending application Serial No. 106,080, filed October 17, 1936, for Washing and cleaning machine, now Patent 2,282,332, granted May 12, 1942.

The invention provides a washing and cleaning machine of extremely simple construction which provides all essential operations to effect a rapid and thorough cleaning or washing of the articles. These operations include circulation of the articles in the washing fluid, scrubbing and shaking of the articles, agitation and flexing of the fabric of the articles and rapidly pulsating the fluid through the fabric.

The machine of the present invention includes a rapidly reciprocating washing element submerged in the washing fluid, provided with one or more circumferential projections or discs serving as scrubbing surfaces and as means providing a unidirectional flow of circulatory motion of the fluid whereby the articles being cleaned are successively and repeatedly drawn into a scrubbing zone adjacent the washing element wherein they are scrubbed and vigorously shaken. Additionally, the motion of the washing element produces sufficiently vigorous pulsations which spread throughout the body of the fluid and serve to loosen and remove dirt by rapidly flexing and agitating the articles and pulsating the fluid through the fabric. The washing element also functions to untangle any fabric or article which may have become tangled with another or others during the washing action.

The intensity and rapidity of the washing action may be readily varied by varying the stroke or the speed of movement of the washing element or the rate at which it reciprocates, thereby to produce as gentle or as vigorous a washing action as may be desired to suit the particular type of fabric undergoing treatment. The structure of the washing element permits the use of an elastic material which will preclude injury to fabrics even with the most vigorous washing action. The speed and direction of the circulation of the fluid and the articles being treated may be altered by variations in the form and size of the washing element.

This application discloses improvements in, and variations of, the washing machine disclosed in my prior filed copending application, Serial No. 92,500, filed July 25, 1936, now Patent 2,142,961, granted January 3 1939.

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The invention in its several aspects will be understood from the following description considered in connection with the accompanying drawings forming a part thereof, and in which:

Fig. 1 is a more or less diagrammatic view in vertical section of a preferred form of washing machine;

Fig. 2 is an elevational view of another preferred form of operating mechanism for the washing element; and

Fig. 3 is a partial view taken substantially on line 3—3 of Fig. 2.

Like characters of reference refer to the same or similar parts throughout the several views.

Referring to the drawings, the washing machine therein shown operates substantially as disclosed in my said copending patents, particularly 2,282,332, except as herein described.

In the form of washing machine illustrated in Fig. 1, the circulation of the washing or treating fluid in the tub is opposite in direction to the circulation obtained in the machine illustrated in Patent 2,282,332. The washing element is centrally or axially disposed with respect to the tub 80, and includes four discs 81, 82, 83 and 84 which are mounted in spaced relationship on operating shaft 85 which extends through a packing gland 86 in the bottom of the tub. A diaphragm such as 25 in the referred to patent may be substituted for the gland 86. The discs are arranged and constructed so as to cause the treating fluid and the articles being treated to flow toward the washing element in the upper portion of the fluid, thence downwardly in the scrubbing zone, which is that portion of the tub disposed immediately adjacent the washing element, after which the fluid and articles flow radially outwardly at the bottom of the tub to the wall thereof and thence upwardly along this wall as indicated by the direction arrows in Fig. 1. More specifically the discs 81 to 84 are formed as disclosed in Fig. 1 to provide a series of inverted cup-shaped members with thickened outer peripheral edges as shown. The cups are of gradually decreasing diameters progressively from the bottom cup 81 to the top cup 84 but these discs may be of diameters other than those disclosed with one or more of the discs of the same diameter, or they may be of other relative sizes. The discs may be of any suitable material such as metal, hard rubber, Bakelite, etc., but are preferably of elastic or flexible material such as live rubber, or suitable rubber composition reinforced with fabric, metal or other material such as suitable metal reinforcements 87, although fabric or other suitable re-

inforcing material may be employed. As shown, the bottom of the tub 80 extends outwardly and downwardly in a smooth curve and connects to the cylindrical wall which is shown as slightly inclined to the vertical, outwardly. This configuration of the tub is suitable for the circulation indicated and described, but satisfactory results are obtained with a tub having a flat bottom and a vertically disposed wall. The function and operation of the washing element and its discs is the same, or similar to, the function and operation of the discs 16 to 19, in the machine shown in Figs. 1 and 3 of Patent 2,282,332, excepting that the circulation of the fluid in the tub is in the reverse direction. The tub may contain 18 gallons of warm water, 4 ounces of soap, and 12 pounds of soiled dry clothes. The washing element may be reciprocated at the rate of 600 strokes per minute with a 1½" stroke. Discs 81 to 84 may be arranged similarly to the discs 16 to 19 to produce a similar effect on the circulation of the fluid and articles but in the reverse direction.

The operating mechanism for the washing element shown in Fig. 1 is arranged to provide an adjustment of the length of the stroke of the washing element. In the form shown, drive shaft 88 is rotated by an electric motor or other suitable means through a belt drive or suitable gearing. Eccentric 89 is fixed to shaft 88 and eccentric strap 90 has an arm 91 pivoted to one end of operating lever 92 which is pivotally connected at an intermediate portion 93 thereof to shaft 85 of the washing element. The other end portion 94 of the lever 92 passes in sliding relationship through a block 95 which is pivotally secured in oppositely disposed trunnions to a carriage 96 theadedly mounted on an adjusting screw 97. Washing element shaft 85 extends through spaced bearings 98 and 99. With this arrangement it will be perceived that rotation of the driving shaft 88 will cause the left hand end of lever 92, as seen in Fig. 1, to reciprocate in a vertical plane about the trunnions 100 on block 96 as a fulcrum. This motion of lever 92 will impart a vertically reciprocating motion to the shaft 85 and to the washing element secured thereto. The length of the stroke of the washing element may be varied by adjustment of screw 97 which moves the fulcrum of lever 92 toward or from the shaft 85. As the fulcrum moves toward shaft 85 the length of the stroke of the washing element will be diminished, whereas movement of the fulcrum away from the shaft 85 will cause the stroke of the washing element to be increased. While in the form shown, the stroke of the washing element may be varied within certain limits depending upon the proportions of the operating mechanism, the arrangement is such that the length of stroke of the washing element may not be reduced entirely to zero. However, slight change in the block 96 and associated parts as disclosed in Figs. 2 and 3 will permit the positioning of trunnions 100 which function as the fulcrum for lever 92 in alignment with the axis of shaft 85 so that zero stroke for the washing element may be obtained. It will be understood that the operation is such that the washing element is rapidly reciprocated with relatively short strokes as in the case of the washing element disclosed in Figs. 1 and 3 of the patent.

Another form of operating mechanism is illustrated in Figs. 2 and 3. The arrangement is such that the washing element is moved more rapidly in one direction than in another and the length of the stroke may be varied from zero to maximum for the device. The operating disc 110 may be rotated by any suitable means at any desired angular velocity. Pin 111 on the disc moves in a slot 112 in one end of a lever 113 which is pivotally connected at an intermediate portion 114 to washing element shaft 20 or 85. The other end 115 of the lever 113 is slidably mounted in a block 116 having spaced ears 117 disposed so as to receive between them that portion of the lever 113 which is pivoted to the washing element shaft. Ears 117 are pivoted at 118 to spaced ears 119 on a rack bar 120 slidably mounted on a supporting rod 121. The teeth of rack bar 120 are in mesh with the teeth of a pinion 122 fixed to a shaft 123 which may be rotated by hand or by other means. With operating disc 110 rotating in a counter-clockwise direction as seen in Fig. 2, the washing element on shaft 85 will be moved upwardly relatively rapidly and will be moved downwardly relatively slowly. With operating disc 110 rotating in a clockwise direction, the washing element will be moved upwardly relatively slowly in the direction of the closed ends of the cups and will be returned relatively quickly in the direction of the outward flare of the cups. The length of the stroke of the washing element may be varied from zero to maximum for the device, for example 2" or thereabouts, by movement of pinion 122 to move the fulcrum 118 for the lever 113 between a position in alignment with the pivot 114 and a position removed therefrom the greatest distance possible for the mechanism. Positions of fulcrum 118 intermediate these extreme positions will provide intermediate lengths of stroke for the washing element.

The washing elements constructed and operated as previously described produce a pulsating unidirectional flow of fluid. This character of flow is due to the fact that the discs of the washing element constitute fluid propelling projections, the upper and lower surfaces of which encounter different degrees of resistance to their passage through the fluid. When the discs are of flexible or elastic material or construction, the effective diameters alternately decrease and increase during operation on their upward and downward strokes respectively, whereby their fluid propelling action as previously described is further amplified. This pulsating unidirectional flow of the fluid carries the articles into proximity of the washing element which engages the articles singly and pulls them individually in a series of short, fast jerks past the scrubbing edges which shake, flex and briskly rub the fabrics and propel them through the scrubbing zone and then outwardly, after which they are carried by the currents of fluid to points in the tub where they begin a new cycle. Throughout the process of washing, the fluid continuously pulsates back and forth through the meshes of the fabric thereby loosening the dirt preparatory to its removal in the scrubbing zone. Whereas a steady pull would not loosen an article entangled in a mass, a series of fast, short jerks such as produced by the machine of my invention, readily does so.

Inasmuch as the rate and direction of circulation of the fluid, the intensity of the washing action, and other factors depend upon the shape, size, number and relative position and inclination of the surfaces of the discs as well as upon the operating speed of the washing element, it will be readily perceived that any or all of these

factors may be modified as desired to meet any particular requirements.

It will be understood that the direction of fluid circulation obtained during operation of the washing elements shown may be reversed merely by inverting the surfaces of the discs of the washing elements.

In the embodiments of the invention herein disclosed, the washing element is operated in a substantially cylindrical tub, but the washing element may be shaped to suit any other shape of tub, such as rectangular, in which case the washing element may consist of rigid or elastic strips of a configuration to conform to the shape of the tub to produce uniform circulation of fluid throughout the tub. For example, a long, rectangular tub may be used with a washing element positioned longitudinally in the latter and consisting of elongated strips supported by a vertically disposed plate which is vertically reciprocated rapidly with short strokes.

It will be obvious that changes may be made in the form, location, relative arrangement and the materials of the several parts of the machine disclosed without departing from the principles of the invention. Accordingly no intention is entertained to limit the invention except by the scope of the appended claims.

What is claimed is as follows:

1. Apparatus for treating articles with fluid comprising a tub, an outwardly flared washing element in said tub reciprocating in the axis of the flare of said element and producing toroidal circulation, power means connected to said element to impart oppositely directed rapid, rectilinear, short strokes thereto, said last named

means having provisions for imparting faster strokes in the direction of the outward flare of said element than in the other.

2. Apparatus for treating articles with fluid comprising a tub, a substantially vertically reciprocating outwardly flared washing element in said tub producing toroidal circulation, power means to impart oppositely directed, rapid, rectilinear, short strokes to said element, said power means including an eccentric rotatable member, and connections between said eccentric member and said reciprocating element imparting faster operation during the portion of the stroke in the direction of the flare than during the corresponding opposite portion of the stroke.

GEORGE KUHN.

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