

April 30, 1940.

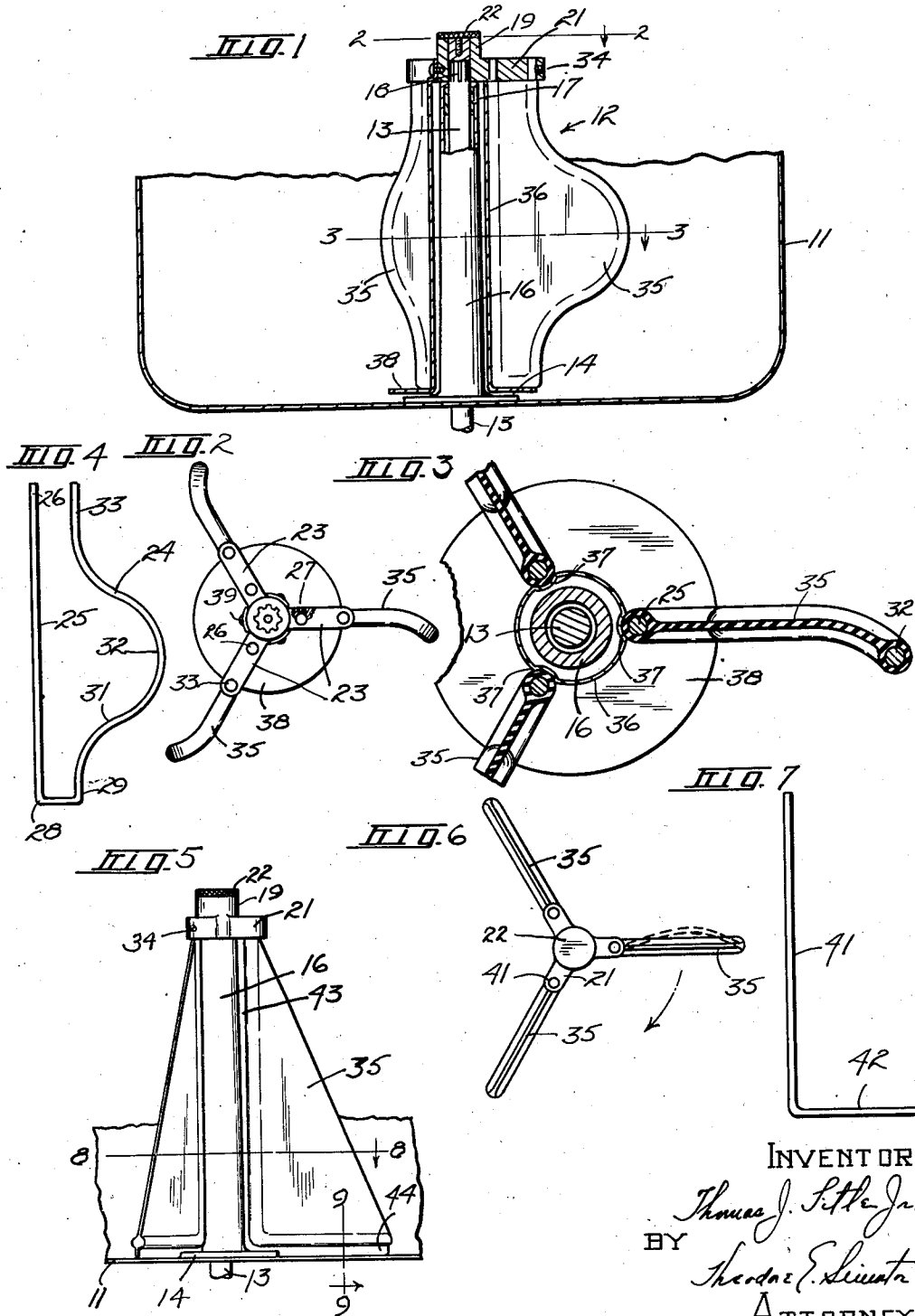
T. J. LITTLE, JR

2,199,027

AGITATOR FOR WASHING MACHINES

Filed April 20, 1937

2 Sheets-Sheet 1



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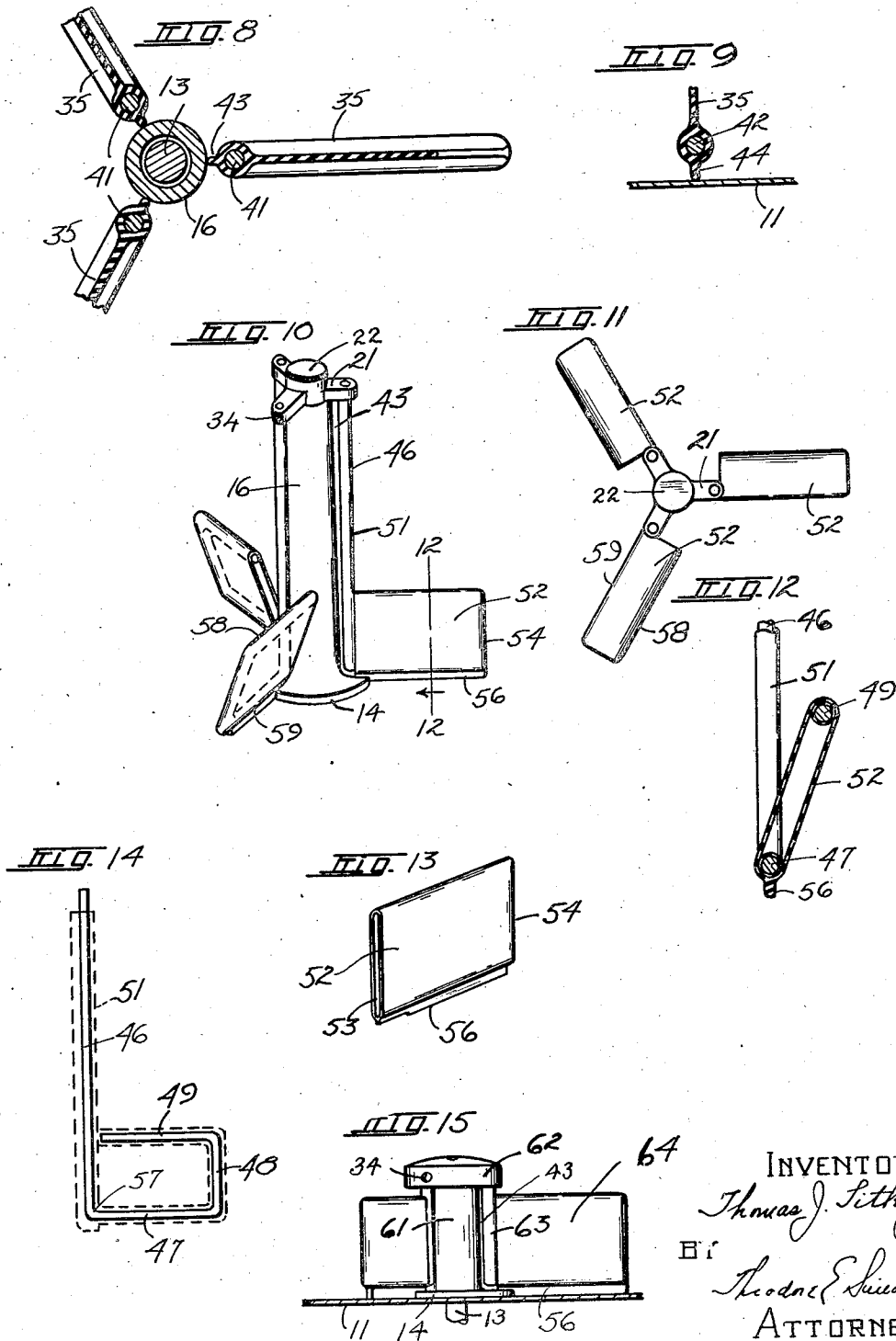
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AGITATOR FOR WASHING MACHINES

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Application April 20, 1937, Serial No. 137,999

15 Claims. (Cl. 68—134)

My invention relates to washing machines and more particularly to a novel agitator construction.

The agitating element or dolly, as it is sometimes called, of a washing machine has been commonly, in the commercial art, made of alloys of aluminum. Aluminum has been most commonly employed because of its relatively non-corrosive qualities, its lightness, pleasing appearance and the ease with which it may be cast. Aluminum agitators are usually either die cast or cast in a permanent mold. Because aluminum is rather soft, means are usually employed to harden the surface of the casting. One of these methods is called "anodizing," which is an electrolytic process of providing the casting with a hard, resistant surface. This process of treatment, while it effectively makes the agitator more resistant to the corrosive action of the washing fluid and more resistant to wear, provides the agitator with an abrasive surface which has a deleterious, abrasive action on the clothes being washed. Moreover, the surface of the agitator, primarily due to corrosion, becomes pitted in use which increases the abrasive action of the agitator. A further serious disadvantage of the use of aluminum is the fact that aluminum is rather expensive, particularly at the present time, its cost having more than tripled in the past three years. In addition, after long use the blades become thin and worn as a result of the continued action of the blades upon the clothes being washed and the corrosive action of the washing fluid.

An object of my invention is to provide an agitator for a washing machine which may be manufactured at a minimum cost.

Another object of my invention is to provide an agitator which may be made of inexpensive materials and which still retains the advantages of an aluminum agitator in that it is non-corrosive, light in weight and pleasing in appearance.

A further object of my invention is to provide an agitator made of such materials that the agitator presents a smooth, non-abrasive surface to the clothes and which is long wearing and does not become rough or pitted in use.

My invention further contemplates the provision of an agitator which may be made of inexpensive materials, is easy and cheap to fabricate and which will wash the clothes efficiently, thoroughly and in a minimum length of time.

More specifically, my invention contemplates the provision of an agitator for washing ma-

chines which includes one or more blades formed by bending a relatively stiff inexpensive material, such as a metal rod, into a desired shape to form a frame or support for receiving a web of material of such character that it may be formed or molded on to the frame as, for example, a rubber composition material, whereby to form on the frame a web or blade surface which is preferably pliable and resilient in character.

Other objects and advantages of my invention will be more apparent from the following description when taken in connection with the accompanying drawings, in which:

Figure 1 is a vertical view, partly in section, showing my novel agitator mounted in a washing machine vat.

Figure 2 is a top plan view of the agitator of Figure 1 taken on the line 2—2 of that figure.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1 and showing the construction of the blades.

Figure 4 is a view showing the manner in which the metal rod is bent to provide a form or frame upon which the blade surface of the structure of Figures 1 to 3, inclusive, may be molded.

Figure 5 is a view, similar to that of Figure 1, showing a modified form of my invention.

Figure 6 is a top plan view of the structure shown in Figure 5.

Figure 7 is a view, similar to that of Figure 4, showing the shape of the metal rod upon which the blades of the structure of Figures 5 and 6 may be formed or molded.

Figure 8 is a view taken on the line 8—8 of Figure 5 showing the construction of the blades of that modification.

Figure 9 is a view taken on the line 9—9 of Figure 5 showing the means employed for preventing clothes from being caught between the bottom of the blade and the bottom of the vat.

Figure 10 is a perspective view showing still another modified form of my invention.

Figure 11 is a top plan view of the agitator construction shown in Figure 10.

Figure 12 is a view taken on the line 12—12 of Figure 10 showing how the blades of the agitator of that figure are inclined.

Figure 13 is a view showing one of the rubber or other composition boots forming the blades of the structures of Figures 10 to 12, inclusive.

Figure 14 is a view showing how the metal rod used to form the frame for receiving the boot of Figure 13 is bent and protected against corrosion.

Figure 15 is a vertical view showing how the

structure of Figures 10 to 14, inclusive, may be applied to a low center-post agitator.

The agitator of my invention is adapted to be mounted in a vat or tub 11 in which washing fluid and the clothes to be washed are placed. The washing vat may be of any desired shape, either square or circular in cross section. Preferably, the vat is considerably larger in diameter than the over-all diameter of the agitator in order to provide a space around the agitator for receiving and enabling the free circulation and agitation of the clothes.

The agitator, generally indicated by the numeral 12, is preferably mounted centrally of the vat 11 and is driven by a shaft 13 extending upward through the bottom of the vat. The drive shaft 13 may be driven by any suitable mechanism and from any suitable source of power, not necessary to be shown or described herein since such driving mechanism for operating the agitator is well known in the art to which this invention applies. While my invention is equally adapted to the construction of an agitator adapted to be continuously rotated in one direction, preferably, the shaft is driven in an oscillatory manner so as to drive the agitator through an arc of 180°, more or less, at a comparatively high rate of speed, for example, between fifty and sixty oscillations per minute.

Extending from the bottom of the vat and having at its lower end a flange 14, adjacent the bottom of the vat, is a sleeve 16 which extends upward concentric with the drive shaft 13. Suitable packing is provided between the flange and the bottom of the vat to prevent leakage of cleansing fluid therefrom. The upper end of the sleeve 16 has a bearing 17 which serves to support the shaft. The upper end of the sleeve extends above the normal surface level of cleansing fluid in the vat to prevent the leakage of cleansing fluid downward along the shaft. The upper end of the shaft is splined, as indicated at 18, to receive cooperating splines formed on the hub 19 of a spider 21. A cap 22, threaded into the end of the shaft, retains the spider on the shaft. In the drawings, I have shown a spider having three arms 23, although it will be appreciated that any number of arms may be used, depending upon the number of blades to be employed. Moreover, it will be appreciated that instead of using a spider, a circular cap may be provided.

In the commercial agitators of the prior art, it has been common practice to cast the agitator of an aluminum alloy. Aluminum alloys have been used, almost to the exclusion of other materials, because they are relatively resistant to the action of the alkalis used in commercial clothes washing compounds. While aluminum is relatively resistant to the action of the washing fluid, it does become pitted in use. Moreover, the anodizing process, mentioned above, gives the agitator a hard, abrasive surface. This abrasive surface and the pitting of the surface, as well as the fact that, due to the cost involved, washing machine agitators are seldom provided with a smooth finish throughout, causes an abrasive action on the clothes during washing operations. This abrasive action causes excessive wear on the clothes. Moreover, an agitator made of an aluminum alloy is quite expensive, particularly at the present time. In addition, the clothes, during the washing operation of the usual agitator, are struck by the rigid, non-yielding blades of the agitator and this, together with the cutting action of the

relatively sharp edges of the blades, causes considerable wear on the clothes. This excessive wear is evidenced by the lint appearing on the bottom of the vat after the washing action of the usual agitator is completed and the clothes have been removed from the vat.

I have found that all of the objections above enumerated may be eliminated by making the agitator of rubber or other equivalent material. I also contemplate the use of synthetic resin products and other plastics. While the plastics are suitable for use, they are, in general, more expensive than rubber compounds and do not provide the soft, yielding washing action on the clothes which it is my desire to accomplish.

In accordance with my invention, a stiff frame is formed, preferably of a metal rod. The rod, while it may be made of any suitable metal, is preferably of a steel capable of being bent to a desired shape without difficulty. As will be described in greater detail later, the rod may be bent into any desired shape to provide a form, frame or supporting structure for the material of which the blade proper is to be made.

In Figure 4, I have shown a rod 24 which has a straight portion 25. The upper end 26 of the portion 25 is adapted to be secured in an aperture formed in the spider 21 by means of a set screw 27, although, of course, other means of securing the rod to the spider may be employed. At its lower end 28, the rod is bent at right angles and then rebent at 29 and curved outward and upward as at 31 to provide a relatively wide portion 32. The rod is then bent inward and upward substantially in a semi-circle and, at its upper end 33, is bent parallel to the end 26. The end 33 of the rod is also fitted into the spider and retained in position by a set screw 34. There is thus provided a form or frame for receiving a web structure or blade 35 made of such materials that it may be molded or otherwise formed on the frame.

As mentioned above, I prefer to use a rubber composition for the reason that it is inexpensive, easy to mold on the frame and gives the agitator blade a pliable, resilient surface which, during the operation of washing clothes, exerts a soft, yielding washing action without causing a pounding of the clothes as is occasioned by a rigid blade of metal or other non-yielding material. Of course, it will be understood that the frame is first made, the rubber composition molded thereon and then the completed blade is secured in the spider. Any number of such blades may be employed, but I preferably use three blades as I believe that three blades give the best washing action.

The use of the metal rods spaced around the central sleeve 16 causes longitudinally extending openings to exist between the rods and the sleeve and between adjacent rods in which clothes, during the washing operation, are likely to be caught. To close these spaces, I provide a tube 36 which engages the vertical edges of the rubber formed around the rods as more clearly shown in Figure 3. The tube extends concentric with the sleeve 16 and is preferably notched, as indicated at 37, to receive the rounded surfaces of the rubber molded around the rods. It will be noted that the rods upon which the blades are formed are held only at their upper ends so that there is a tendency, during the washing operation, for the entire blade to yield during its oscillatory movement. The tube 36, by reason of the notches, tends to hold the blades more nearly rigid. To

prevent clothes from being caught beneath the blades, the lower end of the tube 36 is flanged, as indicated at 38, to provide an annular surface between the bottom of the blades and the bottom of the vat. The tube may be held in position in any suitable manner, as by securing it to the spider by means of screws 39.

As shown more clearly in Figures 2 and 3, at their widest portions the rods 32 may be bent so that the blades appear in horizontal cross section as shown in Figure 3. Preferably, the blades are all bent at their outer ends in the same direction so that when the agitator is oscillated in a vat containing clothes and washing fluid, the sides of the blades having the bent or hooked ends exert a greater thrust on the clothes and washing fluid than the opposite sides of the blades, resulting in a general tendency for the clothes to circulate in one direction around the vat. The blades of the agitator may be similar in shape to those shown in application Serial No. 55,050, filed in the name of Peter Eduard Geldhof on December 18, 1935, which application matured into United States Letters Patent No. 2,094,559, granted September 28, 1937, and may, if desired, be provided with apertures as shown in that application.

I have tested an agitator having a web or blade surface of rubber, made in the manner above described, and have compared the efficiency of such an agitator with a metal agitator of the same size and shape, an agitator similar to that shown in the above mentioned Geldhof application. I have found that the washing efficiency of the agitator of my invention, as measured by soil tests, is considerably higher than that of a metal agitator. Notwithstanding, I have found that the agitator of my invention exerts a substantially less harsh action on the clothes, as measured by wear tests, and as evidenced by the comparative lack of lint in the bottom of the vat after the washing operation is completed.

That, in operation, my agitator causes less wear on the clothes, I believe to be due to the elimination of the pounding action which the clothes receive from the hard, non-yielding metal blades of the agitator of the Geldhof application and the contact with the clothes by the relatively sharp, metallic edges of the blades of that agitator. The relatively less wear on the clothes and increased efficiency is not only present when the agitator, above described, is compared with the corresponding agitator shown in the above mentioned Geldhof application, but is also present when other shapes of agitators, made in accordance with my invention, are compared with their prototypes made of metal. The increased efficiency of the agitator of my invention may be due to the fact that the rubberized surfaces of the blades tend to cause the clothes to adhere thereto more than in the case of metal blades. This, I believe, causes the clothes to partake to a greater extent of the movements of the agitator and thus receive a more violent agitation.

It will be appreciated that when the agitator, above described, is in operation the clothes are engaged by relatively soft, pliant, yielding surfaces which are incapable of causing the pounding action on the clothes occasioned by the metal agitators of the prior art. It will, moreover, be appreciated that the surfaces of the rubberized blades are relatively smooth and do not become pitted in use as in the case of an aluminum alloy agitator.

In Figures 5 to 9, inclusive, I have shown a

modified form of my invention which is generally of the same construction as that shown in Figures 1 to 4, described above. In this modification, however, the rods are bent into an L-shaped form, as shown in Figure 7, the part 41 of the rods being perpendicular to the part 42. After the rubberized coating, or coating of other material, is applied to the bent rods, the rods are secured in the spider 21 in the manner above described. In this structure, to prevent the clothes from being caught between the rods and the sleeve 16 and between adjacent rods, instead of using a metal tube such as the tube 36 of the construction shown in Figures 1 to 4, I mold integral with each of the blades a longitudinally extending fin 43, more clearly shown in Figure 8. As the agitator is oscillated, the fins, which may engage the surface of the sleeve, prevent clothes from being caught between the sleeve and the rubberized surface encircling the rods. A similar method is employed to prevent clothes from being caught between the bottoms of the blades and the bottom of the vat, as shown more clearly in Figure 9, a fin 44 being molded integral with each of the rubberized blades. The fins extend below the portions 42 of the metal rods and lie in close proximity to and may be shaped to conform to the bottom of the vat.

It will be noted that the blades of the agitator of this modification are triangular and have the appearance of sails. The blades or webs of this agitator, when the agitator is rotated, for example, in the clockwise direction, as indicated by the arrow in Figure 6, due to the resiliency of the material of which the blades are fabricated, tend to belly out or fill like sails in the wind. When the agitator reverses, at the instant of reversal, the clothes in engagement with the blades are thrown or catapulted violently in the clockwise direction in much the manner of a stone thrown from a sling-shot. A similar action, in the opposite direction, occurs after the agitator has completed its counterclockwise rotation and reverses. While the catapult action described, when the agitator of this modification is operated, is very prominent and clearly visible when viewed through the walls of a glass vat, this action is probably also present to a certain extent when the agitator of Figures 1 to 4, inclusive, is operated.

While the blades of the agitator of this modification may be made by molding or otherwise forming the rubberized material on the frame, the shape of this agitator lends itself admirably to the use of heavy canvas or rubberized cloth suitably fastened to the frame. I contemplate the use of these and similar materials as being within the scope of my invention. If desired, the surface of the blades of this modification may also be provided with apertures.

In Figures 10 to 14, inclusive, I have shown another modified form of my invention in which the rods 46 are secured to the spider 21 in a similar manner to that described above. The rods of this modification extend downward, as indicated in Figure 14, and have horizontally bent portions 47, the outer ends of which are bent vertically as indicated at 48. Rebent portions 49 are formed parallel to the portions 47. The metal rods, which are preferably of steel because of its relative cheapness, may be protected against the action of the washing fluid by coating the rods with rubber, as indicated at 51. The application of the rubber to the rods is a relatively inexpensive operation

and is cheaper than providing rods of a metal resistant to the action of the washing fluid.

In this modification, to form the blades, instead of molding a suitable material on to the frames formed by the bent metal rods, webs or boots 52, made of rubber or other suitable material, may be used. One end of each of the rubber boots may be open, as indicated at 53, and the other ends 54 closed. The rubber boots may be readily stretched and slipped over the frames and thus held in position. The lower ends of the rubber boots may be provided with fins 56, similar to the fins 44 described above in connection with the structure shown in Figures 5 to 9, inclusive. These fins lie closely adjacent the bottom of the vat and prevent clothes from being caught beneath the bottoms of the blades. If required, also with this construction, fins extending longitudinally of the rods and engaging the sleeve may be provided.

It will be appreciated that, depending upon the character of the washing action desired, the rods may be bent into any suitable shape capable of retaining the boots in position. The blades may be radial with respect to the sleeve 16, may be curved in horizontal cross section or may be bent forwardly, as indicated in the drawings. A radial blade will, of course, if oscillated through equal arcs in the opposite directions of rotation, cause the clothes to oscillate backward and forward with the agitator. If the rods are bent at the point 57 to extend forwardly as shown in Figure 10, the upper edge 58 will extend forwardly beyond the lower edge 59 so that when the agitator is oscillated a somewhat different action upon the clothes and washing fluid will be caused. I have not shown a blade construction in which the blades are both curved and inclined. It will, however, be appreciated that the blades, by suitably shaping the frame, may be caused to assume a curved and inclined position with respect to the axis of oscillation, and be somewhat similar to the blades shown in Figure 3 of application Serial No. 686,172, filed in the name of Jabez C. Nelson on August 21, 1933, which application matured into United States Letters Patent No. 2,096,683, granted October 19, 1937.

In each of the three modifications described above, I have shown my invention as applied to an agitator in which the center post or sleeve 16 which supports the shaft in high and extends above the normal surface level of cleansing fluid in the vat. It will, however, be appreciated that, as indicated in Figure 15, my invention may be applied to a low center post type of agitator. This may be accomplished by providing a sleeve 61 similar to the sleeve 16 except much shorter. A spider 62 corresponding to the spider 21 is also provided. Where a low center post agitator is used the spider should preferably be circular in cross section. The rods, indicated at 63, are relatively short and may be bent into the form shown in Figure 14 and webs or boots 64, similar to the boots 52, may be applied to the bent rods.

It will be appreciated that I have provided an agitator which may be formed in any desired shape, which may be made of inexpensive materials and which may be fabricated at a relatively low cost. It will further be appreciated that I have provided an agitator which is light in weight, and yet is adapted to cause a thorough washing of the clothes without causing a pounding of the clothes or an abrasive action on the clothes such as is occasioned by a metal, aluminum alloy agitator.

Moreover, it will be understood, while I have disclosed the most suitable materials of which the agitator of my invention may be made and have disclosed the shape of blades which I deem most desirable, that various equivalent materials may be used and that the blades may be made in any desired shape.

I claim:

1. An agitator adapted to be mounted for operation in a vat containing clothes and washing fluid, said agitator comprising a blade for acting upon the clothes and fluid in the vat, said blade comprising at least two substantially rigid elements having an open space between them constituting a form and a covering of non-rigid material.

2. An agitator adapted to be mounted for operation in a vat containing clothes and washing fluid, said agitator comprising a blade for acting upon the clothes and fluid in the vat, said blade comprising at least two substantially rigid elements having an open space between them constituting a frame and a covering of flexible sheet material enveloping said frame.

3. An agitator adapted to be mounted for operation in a vat containing clothes and washing fluid, said agitator comprising a blade for acting upon the clothes and fluid in the vat, said blade comprising a supporting member having at least two angularly disposed sides with an open space between them and a web portion of flexible material enveloping said two sides of the supporting member.

4. An agitator adapted to be mounted for operation in a vat containing clothes and washing fluid, said agitator comprising a blade for acting upon the clothes and fluid in the vat, said blade being formed of a rod of metal having a rubberized coating formed thereon to prevent the washing fluid from reacting with the metal of the rod, said rod being bent to a predetermined shape to form a frame and a web of flexible material enveloping said frame.

5. In a machine for washing clothes, a vat for containing the clothes and washing fluid, a drive shaft, a rod of metal, means for operatively connecting the rod to the drive shaft whereby the rod is driven thereby, a portion of said rod being bent to a predetermined shape for forming a fluid agitating element carrying frame, and a web constituting the agitating element carried by said frame, said web being made of plastic material.

6. In a machine for washing clothes, a vat for containing clothes and washing fluid, a drive shaft, a frame driven from said shaft, a web of flexible material carried by said frame, a portion of said frame being adjacent the bottom of the vat and a fin of flexible material integral with said web projecting below said frame into close proximity to the bottom of the vat for preventing clothes from being caught between the frame and the bottom of the vat.

7. In a machine for washing clothes, a vat for containing the clothes and washing fluid, a drive shaft, a spider carried by said drive shaft and a plurality of rods carried by said spider and spaced around the drive shaft, a portion of each of said rods being formed into a frame, and a web carried by each of said frames and constituting blades, each of said rods having formed thereon a fin of flexible material extending from the rod inwardly toward the shaft and adapted to prevent clothes from being caught between adjacent rods or between a rod and the shaft.

8. In a machine for washing clothes, a vat for containing the clothes and washing fluid, a sleeve extending upward from the bottom of the vat, a drive shaft extending upward internally of the sleeve and concentric therewith and above the upper end of the sleeve, a spider carried by the upper end of the drive shaft, said spider being adapted to support a plurality of rods extending downward from the spider in spaced relationship with respect to the sleeve, each of said rods having a portion thereof formed into a frame, a web constituting a washing element mounted on said frame, and means extending concentric with the sleeve adjacent said rods for preventing clothes from being caught between adjacent rods or between the sleeve and a rod.

9. In a machine for washing clothes, a vat for containing the clothes and washing fluid, a sleeve extending upward from the bottom of the vat, a drive shaft extending upward internally of the sleeve and concentric therewith and above the upper end of the sleeve, a spider carried by the upper end of the drive shaft, said spider being adapted to support a plurality of rods extending downward from the spider in spaced relationship with respect to the sleeve, each of said blades having a portion thereof formed into a frame, a web constituting a washing element mounted on said frame, and a tube having lengthwise notches for receiving the rods and holding them rigid with respect to each other, said tube extending substantially from the bottom of the vat to the spider and being adapted to prevent clothes from being caught between adjacent rods or between a rod and the sleeve.

10. In a machine for washing clothes, a vat for containing the clothes and washing fluid, a drive shaft, a spider carried by said drive shaft, said spider having secured thereto a plurality of rods extending downward concentric with the drive shaft, each of said rods having a portion thereof extending at right angles to the downwardly extending portion thereof forming an L-shaped frame, and a sail-like web of flexible sheet material carried by said frame, and means for oscillating said shaft whereby the clothes are pushed around the vat by said sail-like web and when the shaft is reversed said sail-like web exerts a catapult action on the clothes and washing fluid at the instant of reversal.

11. An agitator adapted to be mounted for operation in a vat containing clothes and washing fluid, said agitator comprising a blade for acting upon the clothes and washing fluid in the vat, said blade comprising a bent rod of metal forming a substantially closed frame, and a web of plastic material supported on said frame.

12. An agitator adapted to be mounted for

operation in a vat containing clothes and washing fluid, said agitator comprising a blade for acting upon the clothes and washing fluid in the vat, said blade being formed of a metal outlining frame and a web of flexible plastic material carried by said frame, said material being of such character and said frame being of such outline that when the agitator is rotated in one direction or the other the material of the blade tends to belly out behind.

13. In a machine for washing clothes wherein a vat containing the clothes and washing fluid has a drive shaft extending upward through the bottom of the vat, a member mounted at the top of the shaft and adapted to be driven by the shaft, and a plurality of blades depending from said member, each of said blades comprising a rod of metal bent so as to form a skeletal framework with at least one end thereof rigidly secured in said member and a web of plastic material mounted on said framework, each of said blades being independently formed and removable separately from said member.

14. In a machine for washing clothes wherein a vat containing the clothes and washing fluid has a drive shaft extending upward through the bottom of the vat, a member mounted at the top of the shaft and adapted to be driven by the shaft, and a plurality of blades depending from said member and supported solely thereby, each of said blades comprising a rod of metal bent so as to form a skeletal framework with both ends thereof rigidly secured in said member, and a web of plastic material carried by said framework, each of said blades being independently formed, removable separately from said member and extending from said member substantially to the bottom of the vat.

15. In a machine for washing clothes wherein a vat containing the clothes and washing fluid has a drive shaft extending upward through the bottom of the vat, a member mounted adjacent the top of the shaft and adapted to be driven thereby, an agitator depending from and supported solely by said member, said agitator comprising a plurality of blades, each of said blades separately comprising a single rod of metal forming a substantially closed skeletal frame with the ends thereof separately and rigidly secured in said member, and a web of flexible material mounted on each of said frames, said material being of such character and said frame being of such outline that when the agitator is rotated in one direction or the other the material of the blades spaced inwardly from the skeletal frame tends to belly out behind.

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