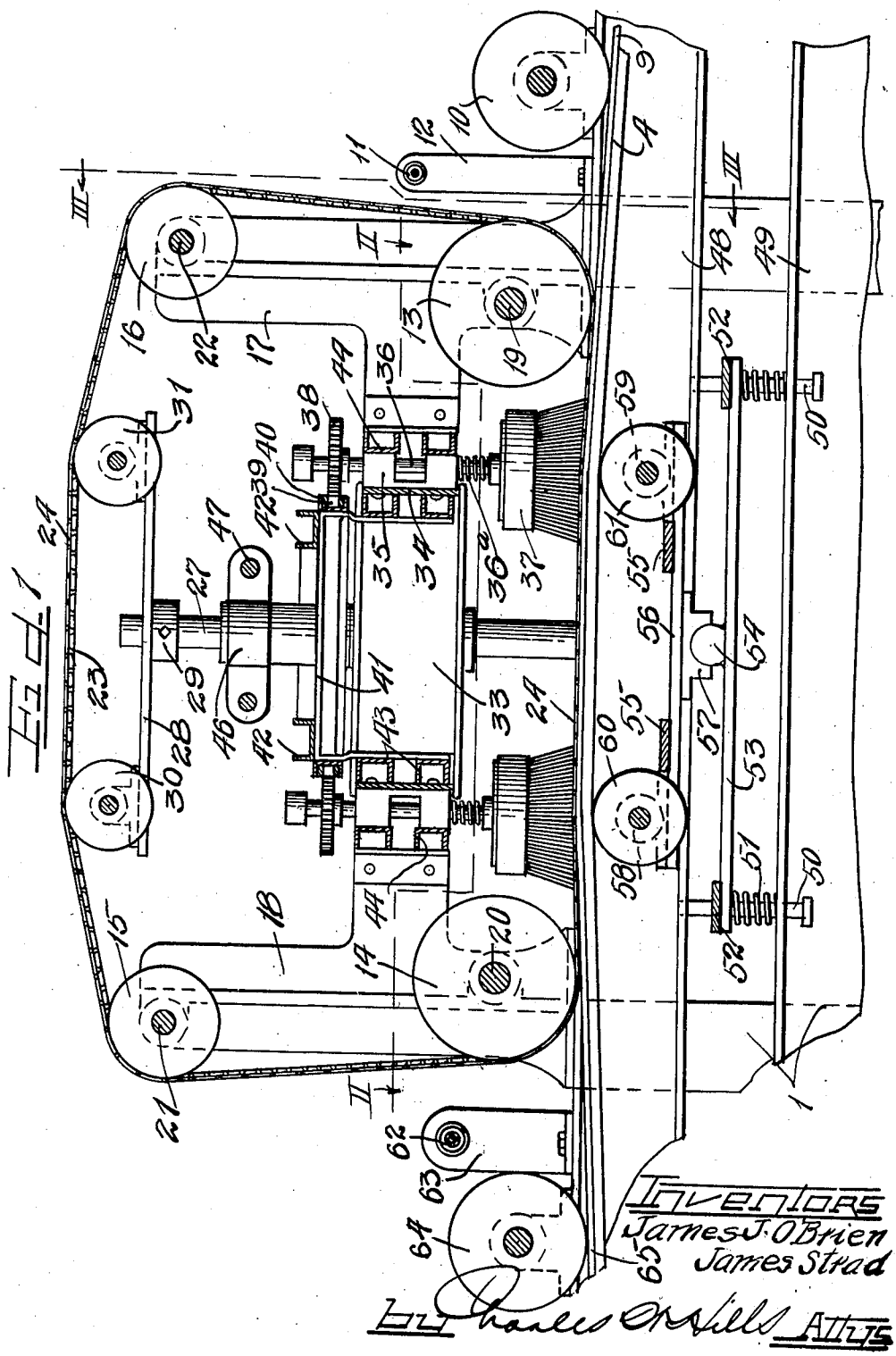
April 25, 1944. J. J. O'BRIEN ET AL 2,347,430

ARTICLE HOLDING MEANS FOR CLEANING MACHINE

Filed Oct. 18, 1940 3 Sheets-Sheet 1



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ARTICLE HOLDING MEANS FOR CLEANING MACHINE

Filed Oct. 18, 1940 3 Sheets-Sheet 2

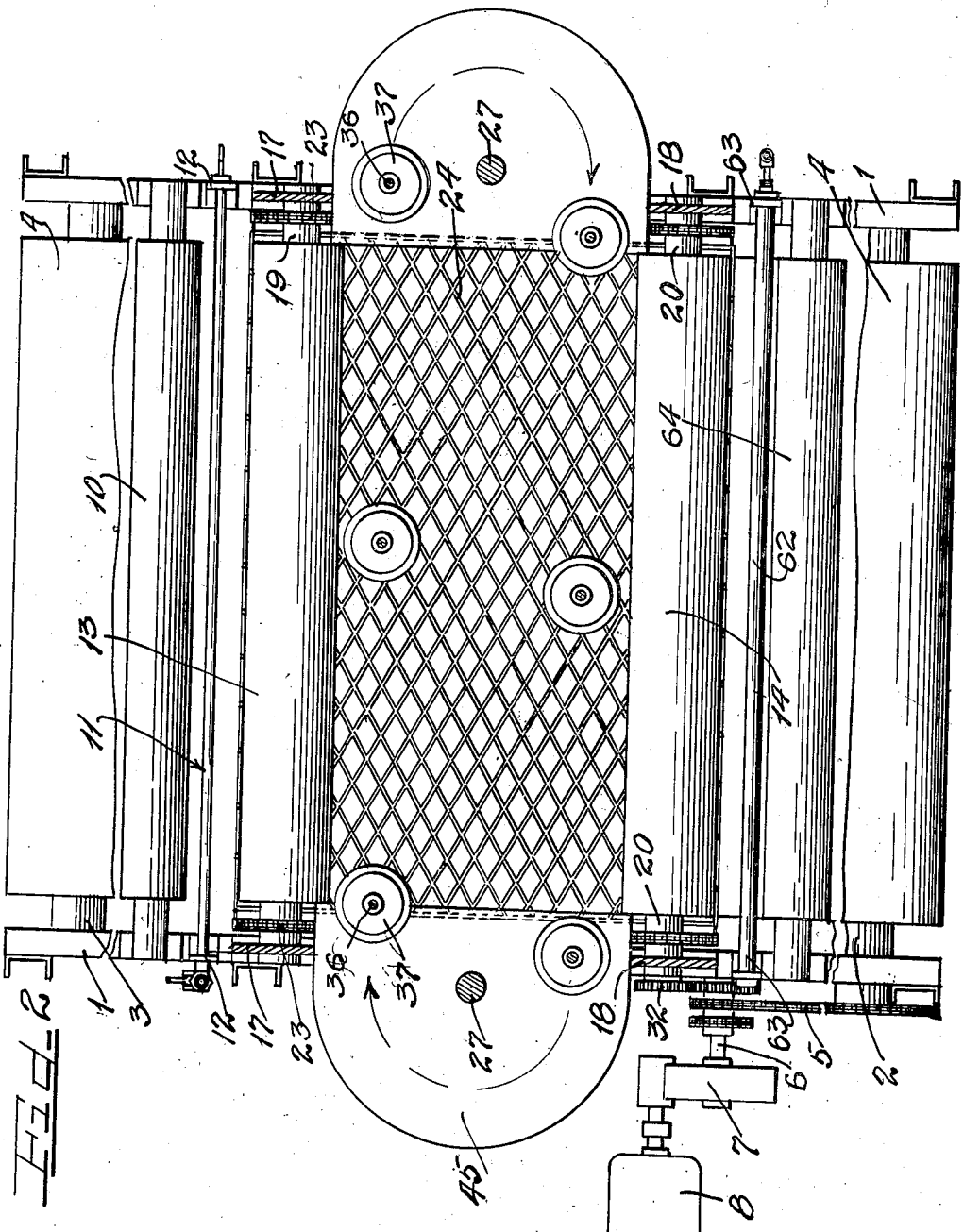

FIG. 2

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ARTICLE HOLDING MEANS FOR CLEANING MACHINE

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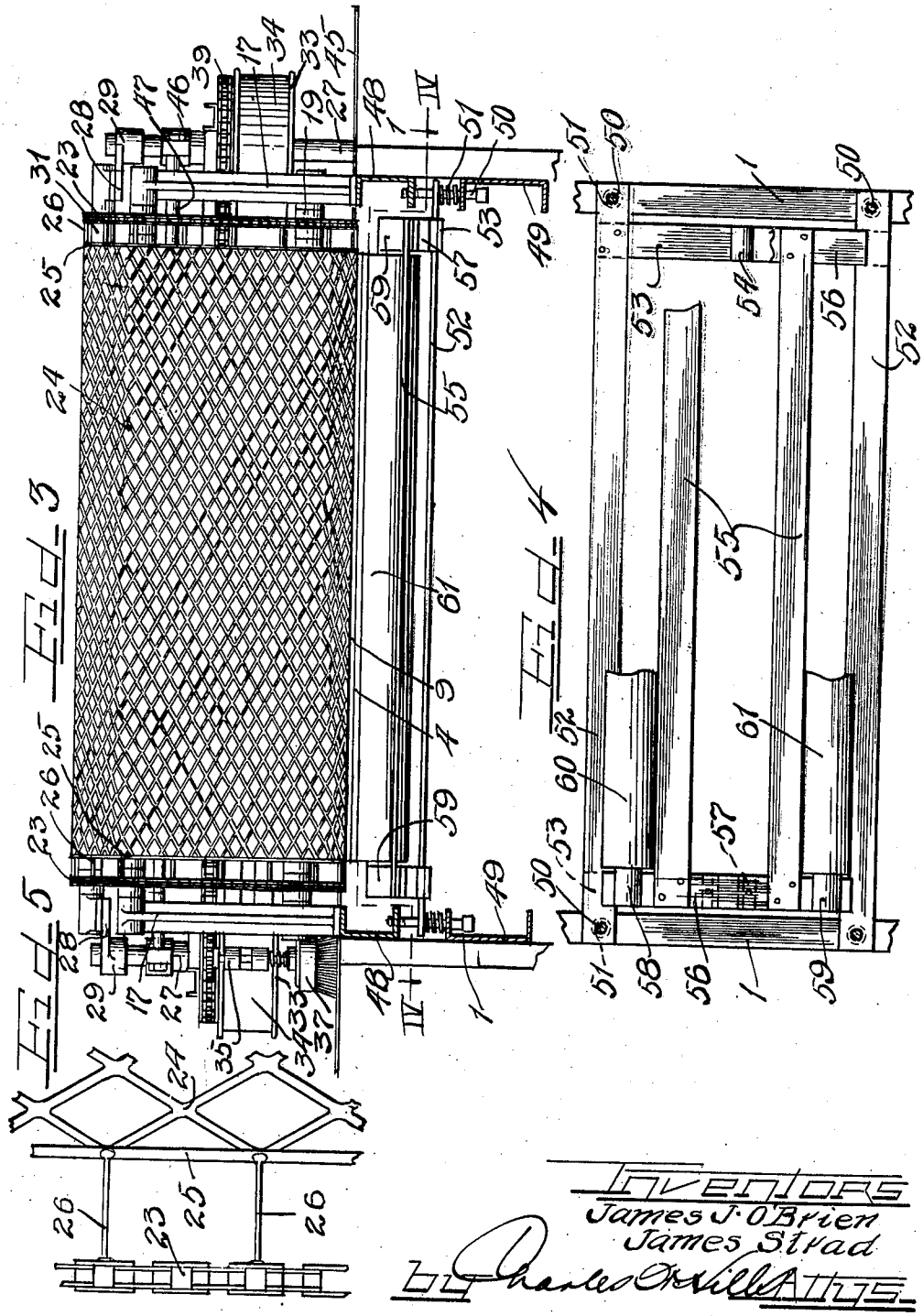

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UNITED STATES PATENT OFFICE

2,347,430

ARTICLE HOLDING MEANS FOR CLEANING MACHINES

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Application October 18, 1940, Serial No. 361,672

11 Claims. (Cl. 15—40)

The present invention relates to improvements in a cleaning machine, and more particularly to article holding mechanism for the machine, to hold the article being cleaned, both from above and below, so that it will be maintained in the proper position and with the proper amount of pressure thereon, although the invention may have other uses and purposes, as will be apparent to one skilled in the art.

The present invention is an improvement upon the invention set forth, described and claimed in our copending application entitled "Cleaning machine," Serial No. 280,254, filed June 21, 1939, now United States Letters Patent 2,310,541, issued February 9, 1943. In such a machine, the article to be cleaned, such as a rug, carpet, and articles of similar character, is carried through the machine on a conveyor belt and all of the cleaning operations occur while the article rests upon this conveyor belt. Scrubbing means are moved both circularly and transversely across the article on the conveyor belt, and it is necessary to use some means to hold the article flatly upon the conveyor belt during the action of the scrubbing means, and also to apply a proper back pressure to the opposite side of the conveyor belt in the regions of the scrubbing elements.

The present invention seeks the provision of a cleaning machine equipped with means to properly hold an article to be cleaned in position during the cleaning operation, the means being such as not only to entirely avoid marking the article with creases or pressure lines, but also to remove any creases or pressure lines which may have been in the article prior to the cleaning operation.

Another object of the invention is the provision of a cleaning machine equipped with a variable pressure mechanism for applying back pressure opposite scrubbing means and on the opposite side of the belt from the article holding means, so that the pressure automatically varies with variations in the article or articles being cleaned and the holding means are thereby enabled to better hold and maintain the article or articles in proper position for cleaning.

It is also an object of this invention to provide article holding means for a cleaning machine, which holding means present an ever-changing surface to the article and through which holding means the scrubbing means of the machine may operate upon the article.

It is also an object of this invention to provide a cleaning machine equipped with scrubbing means and back pressure means acting on the opposite side of the article being cleaned from the scrubbing means, which back pressure means are mounted for substantially universal movement in keeping with the exigencies of shape, size and character of the article itself.

A still further feature of this invention is the provision of a cleaning machine in which an open-mesh holding element acts to maintain an article being cleaned in position upon a conveying belt while the article is being acted upon by cleaning mechanism, and backing rolls disposed beneath the belt opposite the cleaning mechanism and carried upon a cradle construction resiliently urged towards the conveying belt and capable of a substantially universal movement in keeping with variations in size, shape, character, etc., of articles to be cleaned.

While some of the more salient features, characteristics and advantages of the present invention have been above pointed out, others will become apparent from the following disclosures, taken in conjunction with the accompanying drawings, in which—

Figure 1 is a fragmentary vertical sectional view taken longitudinally through a machine equipped with improvements embodying principles of the present invention, parts being shown in elevation and the section being taken just within the side frame of the machine;

Figure 2 is a reduced fragmentary plan sectioanl view taken substantially as indicated by the staggered line II—II of Figure 1;

Figure 3 is a fragmentary reduced vertical sectional view, transversely of the machine, taken substantially as indicated by line III—III of Figure 1;

Figure 4 is a reduced fragmentary plan view of the cradle roll or back pressure structure taken substantially as indicated by line IV—IV of Figure 3, with parts broken away; and

Figure 5 is an enlarged fragmentary view of the open mesh article holding means, illustrating the attachment of this means to its drive.

As shown on the drawings:

In the illustrated embodiment of this invention there is shown a machine including a frame 1 in which the various shafts, unless otherwise specified, are journaled in a well known manner not necessitating detailed description. With reference more particularly to Figure 2, it will be seen that near one end of the machine a drive roll is mounted on a shaft 2, and adjacent the opposite end of the machine another similar roll is carried by a free shaft 3. Over these rolls a conveyor belt 4 is trained, which belt may be made of any suitable material, preferably mois-

ture-proof. This conveyor belt 4 carries the article to be cleaned, such as a rug, through the machine, either backward or forward as may be desired, as more fully explained in our aforesaid copending application. The rug is placed on the conveyor near the roll on the free shaft 3, and if one trip through the machine scrubbing mechanism is sufficient to cleanse the rug, it will pass straight through the machine, without reversal of direction, and leave the conveyor belt near the roll on the drive shaft 2.

The shaft 2 may be driven through a suitable sprocket wheel and chain connection 5, or the equivalent, from a shaft 6 which is in turn preferably operated through a reduction gear box 7 from a source of power, such as an electric motor 8.

By way of example, the present invention will be explained in connection with the cleaning of a rug, which is indicated by numeral 9 in Figure 1 of the drawings. This rug is preferably placed upon the conveyor belt 4 after having been dipped in water or some other suitable liquid. With reference more particularly to Figures 1 and 2 it will be seen that the rug next passes beneath a roll 10 which tends to properly align the rug on the belt. Following the roll 10 the rug next passes beneath a cleansing liquid supply line, generally indicated by numeral 11, supported by suitable brackets 12—12 on the frame 1. This cleansing liquid supply line is more fully described and claimed in our copending application entitled "Liquid applying means for cleansing machines," Serial No. 360,118, filed October 7, 1940. After the cleansing liquid has been applied to the rug, the rug is next engaged by a suitable holding means which maintains the rug in proper position during the operation of the scrubbing mechanism.

The holding means include a set of spaced rolls 13, 14, 15 and 16, arranged substantially in the form of a trapezoid and mounted with the rolls 13 and 16 on one set of superstructure brackets 17—17, and with the rolls 14 and 15 likewise carried in vertical spaced relation on another set of superstructure brackets 18—18. The rolls 13, 14, 15 and 16 are carried, respectively, on shafts 19, 20, 21 and 22, each of which said shafts also carries a suitable sprocket wheel adjacent each end thereof beyond the ends of the respective rolls. Over these sprocket wheels, on each side of the roll, is trained a conveyor chain 23. An open-mesh endless belt 24 is carried between and by the chains 23—23. With reference more particularly to Figure 5 it will be seen that the holding belt 24 may be made of expanded metal, flattened to eliminate any twist in the metal strands, so that the belt, when disposed between the rolls 13 and 14 will present a flat surface against the rug 9. The expanded metal belt is provided with a metallic tape 25 on each side thereof which may be secured to the expanded metal by welding, brazing, or any similar operation. Crossbars 26 are positioned at frequent intervals between the chains 23—23 and the corresponding tape 25, these crossbars also being secured in place as by spot welding, brazing, or similar operation. The weight of the belt is carried, naturally, by the rolls 13, 14, 15 and 16, so that the crossbars 26 are amply sufficient to cause proper movement of the holding belt 24 by the chains 23—23.

Proper tension is maintained on the holding belt 24 by means of an arrangement carried on a pair of stationary vertical shafts 27—27 on opposite sides of the machine. With reference more particularly to Figures 1 and 3, it will be seen that each of the shafts 27 supports a carriage arrangement 28, the height of which may be selectively adjusted by means of a lockable collar 29 engaging the respective shafts 27. Each carriage 28 carries suitable journal means for receiving one end of each of a pair of spaced idler rolls 30 and 31 which ride freely against the underside of the holding belt 24.

With reference to Figure 2, it will be seen that the holding belt 24 is operated through a gear train 32 connecting the aforesaid shaft 6 with the shaft 20 supporting the roll 14 around which the holding belt 24 is disposed. The gear train 32 is so arranged that while the conveyor belt 4 and the holding belt 24 are driven from the same source, the holding belt 24 is driven at a higher rate of speed than the conveyor belt. The working reaches of both belts also travel in the same direction. Thus, with the holding belt moving at a faster rate of speed than the conveying belt, the holding belt not only maintains the rug 9 flatly on the conveying belt but also constantly presents a changing surface of application against the rug. Accordingly, no creases or pressure lines can be left in the rug after it passes beyond the holding belt, but on the contrary, if there are any creases or pressure lines in the rug when it reaches the holding belt, the holding belt will promptly eliminate all traces thereof. Furthermore, as will more fully later appear, the scrubbing means are in the nature of brushes traveling laterally across the rug while at the same time spinning about their own axes. These brushes operate perfectly right through the interstices of the holding belt and consequently strike every portion of the rug, because the holding belt moves at a higher rate of speed than the rug is moving. Furthermore, the action of the interstitial belt 24 upon the rug is such as to raise the nap of the rug in proper position to be fully cleansed by the action of the scrubbing member. This is especially true after the action of the roll 10 upon the wet rug prior to the passing of the rug beneath the belt 24.

The scrubbing mechanism will be described rather briefly herein, since this mechanism is more fully set forth, described and claimed in our copending application, Serial No. 280,294, aforesaid. On each of the aforesaid stationary shafts 27 a large pulley 33 is free to rotate relatively to the shaft. One of these pulleys may be rotated by any suitable driving mechanism. Trained around the pulleys 33—33 is an endless belt 34 to which is secured, at intervals, a brush-holding bracket 35. The brush-holding bracket 35 journals the shaft 36 of a rotary brush 37 which, while keyed to the shaft, may reciprocate longitudinally of the shaft 36, and the brush is biased downwardly by spring means 36a disposed between the brush and the bracket, as seen best in Figure 1.

Each brush is caused to rotate about its own axis by virtue of a pinion 38 on the shaft 36 above the bracket 35, which pinion meshes with a sprocket chain 39 carried in a channel 40, which is brazed or otherwise secured to a number of spaced yokes 41 carried by a pair of channel bars 42—42. On each leg thereof, each yoke 41 carries a pair of outwardly opened channel bars 43 which serve in guiding the belt 34 as well as forming sockets for reception of the attachment means holding the various brush shaft brackets

35 to the belt. As is evident from the diagrammatic showing in Figure 2, each brush follows a course transversely across the rug, around the pulley 33, back across the rug, and around the opposite pulley 33. All during this movement, the brush is constantly rotating about its own axis. Suitable guide means 44 are mounted on each of the superstructure brackets 17 and 18 to maintain the brush belt 34 in proper position, and maintain the engagement of the various pinions 38 with the sprocket chain 39. The brushes act directly upon the rug through the interstitial holding belt 24, and at each end thereof, as seen in Figure 2, the brushes pass off of the belt beyond the rug and ride over a brush cleaning plate 45.

Above the brush arrangement on each vertical shaft 27 is a clamp member 46 which carries a pair of cross supporting rods 47 extending over the width of the machine.

In order to maintain proper cooperation among the brushes 37, the holding belt 24 and the rug 9, self-adjusting backing means are provided which act against the under side of the conveying belt 4 against the brush reaches so as to establish a back pressure against the brushes and maintain a substantially firm surface or base along the working reach of the holding belt 24. To this end, we have provided such novel backing means as best seen in Figures 1, 3 and 4.

The backing means are supported by a pair of upper channel irons 48—48 and a pair of lower channels irons 49—49 forming a part of the frame 1. Extending through an opening in the upper flange of the channel iron 49 and threadedly engaged in the lower flange of channel iron 48, on each side of the machine, is a pair of bolts 50—50, spaced longitudinally of the frame members. Each bolt above the flange of the lower channel iron 49 has a spring 51 freely disposed therearound. Resting on the four spring supports thus provided is a base frame comprising a pair of rails 52—52 extending laterally of the machine and a pair of shorter rails 53—53 extending longitudinally of the machine. With reference to Figure 4 it will be seen that the transverse rails 52—52 extend beyond the rails 53—53 and the ends of these transverse rails are each apertured to freely slip over a bolt 50 and rest upon the corresponding spring 51. The transverse rails 53—53 are disposed inside of the flanges of the channel irons 48 and 49. It is therefore apparent that this frame may pivot on the springs 51 longitudinally of the machine, transversely of the machine, or a combination of both.

It will be seen from Figures 1 and 4 that each of the frame members 53 is provided centrally thereof with a shaft-like bearing member 54 to act as a support for a cradle now about to be described.

The cradle also includes a frame embodying a pair of longer members 55 extending transversely of the machine and a pair of shorter members 56—56 extending longitudinally of the machine. Centrally disposed on the under side of each of the frame members 56—56 is a rocking shoe 57 which seats over a respective bearing 54, so that the entire cradle frame may rock longitudinally of the machine on the bearing members 54—54. On the outer side of each of the transverse frame members 55—55, each frame member 56 carries bearing members 58 and 59, respectively, for a pair of rolls 60 and 61, the roll 60 being carried in the bearing members 58—58 and roll 61 being carried in the bearing members 59—59. These rolls are mounted for free rotation by virtue of frictional engagement with the underside of the conveying belt 4, as seen clearly in Figure 1. It will also be noted that the rolls 60 and 61 are preferably disposed directly beneath the transverse reaches of the scrubbing brushes 37, and that these rolls are spaced sufficiently far apart to provide an adequate backing for proper action of the holding belt 24 beneath the working reach of the latter.

In operation, the back pressure mechanism above described has substantially a universal movement which enables it to be self-adjusting almost instantaneously, depending upon the width, thickness, and character of the rug being cleaned. Yet, at no time during the self-adjusting movement of the back pressure mechanism is the pressure of either roll 60 or 61 removed from the underside of the conveyor belt 4. For example, if a rug of narrow width is placed upon the conveyor belt, the lower frame, made up of the members 52 and 53 may pivot transversely of the machine against the action of a pair of the springs 51 and thus maintain pressure across the narrow rug. Also, assuming that one rug is following another through the machine, the cradle frame may rock longitudinally of the machine as each rug edge passes beneath a reach of the brushes or out from under the brushes, and it will be especially noted that the pivotal action of the cradle frame, insofar as the effect is concerned, will not be about the bearings 54—54, but will be about one of the rolls 60 or 61, in view of the action of the four springs 51. That is, with reference to Figure 1, if the end of a rug passes beneath the brushes, directly over the roll 61, this roll will pivot slightly downwardly, but at the same time the roll 60 will maintain its contact with the under side of the belt 4 so that in effect the cradle is pivoting around the shaft of the roll 60, rather than the bearings 54—54. Thus it can be seen that with the roll carrying cradle supported only by the bearing members 54—54 and the under frame supported only by a set of springs 51, the resulting combination of movements, depending upon size, thickness, width and character of the rugs or other articles being cleaned is substantially universal, so that adequate pressure is applied to the underside of the belt 4 wherever needed and at all times.

As the rug passes out from beneath the holding belt 24, it is carried beneath a rinsing liquid supply line 62 carried by suitable brackets 63—63 on opposite sides of the machine. This rinsing liquid supply line removes cleansing liquid and dirt loosened by the brushes from the rug. The basic structure and functioning of the rinsing liquid supply is more fully set forth, described and claimed in our aforesaid copending application, Serial No. 360,118. Adjacent the rinsing liquid supply line is a roll 64 which depresses the rug and conveyor belt 4 as indicated at 65 in Figure 1, so as to maintain the rinsing liquid in one general location along the conveyor belt 4 and permit the rinsing liquid to freely drain from opposite sides of the belt in this location.

From the foregoing, it is apparent that we have provided a novel cleaning machine construction embodying a conveyor belt and means for holding the article to be cleaned upon the conveyor belt, in proper position to be scrubbed directly through the holding means. The holding means presents more open space than solid surface in its contact with the rug, and since it is traveling in the same direction, but at a higher speed than the rug or other article being

cleaned, it permits the scrubbing mechanism to contact every point of the surface of the rug, leaves no creases or pressure lines in the rug, and removes all creases or pressure lines that may have been in the rug prior to the cleaning operation. In addition, it will be noted that a back pressure mechanism is provided to offset the action of the holding means, which back pressure mechanism is automatically self-adjusting and has a substantially universal movement so that adequate back pressure is applied at all points, at all times, and almost instantaneously, depending upon the thickness, width, size and character of the article being cleaned. Further, the present invention, as will be noted from the foregoing disclosure, is economical in construction, positive in action, and highly durable.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention, and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

We claim as our invention:

1. In a cleansing machine, cleansing means, means to support an article to be cleaned, an interstitial belt arranged to hold the article on said article supporting means while cleansing means operates, and means to provide relative movement between the belt and the article being cleaned, said belt including article holding elements disposed at an acute angle to the path of relative movement between said belt and said article.

2. In a rug cleaning machine, a conveyor belt to carry a rug to be cleaned, a series of brushes arranged to travel transversely across the rug on said belt, and an interstitial holding belt arranged to travel over the rug and beneath the brushes, and self-adjusting back pressure means acting on said conveyor belt on the side opposite the rug in the region of said brushes.

3. In a cleaning machine, a conveyor for carrying an article to be cleaned, cleaning means to act on the article on said conveyor and an endless interstitial belt arranged to travel over and relative to the article and beneath the cleaning means to hold the article flatly on the conveyor as it travels adjacent the cleaning means, said belt including elements disposed across the face of the article at an acute angle to the path of travel of said belt.

4. In a cleaning machine, a conveyor to carry an article to be cleaned, cleaning means to act on the article on said conveyor, an endless interstitial belt having a working reach between the article and said cleaning means to hold the article in proper position on the conveyor while the cleaning means are in operation, and drive means for said interstitial belt to cause it to travel at a faster rate than said conveyor belt so as to present an ever changing surface contact with the article.

5. In a rug cleaning machine, a conveyor belt to carry a rug through the machine, cleaning means to act on the rug while on said belt, and holding means to maintain the rug in proper position on said belt during the cleaning operation, and means for moving said holding means relative to the rug surface during its movement with said conveyor.

6. In a rug cleaning machine, a conveyor belt to carry a rug, cleaning means to act on the carried rug, a resiliently supported back assembly beneath the conveyor belt including a frame, a cradle pivotally supported thereon, carrying means for said cradle including means to provide back pressure on said belt opposite said cleaning means.

7. In a rug cleaning machine, a conveyor for carrying a rug, belt-like holding means having a reach bearing against a rug on said conveyor, and a plurality of backing means supported on a common resilient mounting on the opposite side of said conveyor and acting against the conveyor at spaced points therealong to provide in effect suitable back pressure along said reach of said holding means.

8. In a rug cleaning machine, a conveyor for carrying a rug, belt-like holding means having a reach bearing against a rug on said conveyor, a frame on the opposite side of said conveyor, yieldable means supporting said frame, a cradle pivoted on said frame, and a pair of spaced rolls carried by said cradle and bearing against the underside of said conveyor.

9. In a rug cleaning machine, a conveyor for carrying a rug, belt-like holding means having a reach bearing against a rug on said conveyor, a frame on the opposite side of said conveyor, yieldable means supporting said frame, a cradle pivoted on said frame, and a pair of spaced rolls carried by said cradle and bearing against the underside of said conveyor, the pivot point of said cradle being midway between said rolls.

10. In a cleaning machine of the character having a conveyor to carry an article to be cleaned and cleaning means to act on the article carried on the conveyor, backing means on the opposite side of said conveyor including a resiliently supported, unitary cradle and a pair of spaced rolls carried by said cradle in contact with said conveyor.

11. In a rug cleaning machine, in combination, means for supporting a rug to be cleaned, a cleaning assembly operable against the adjacent surface of said supporting means to engage a surface of a rug disposed thereon to clean the same, means for holding the rug flat on said supporting means including a plurality of hold down elements and means for affording relative movement between said supporting means and said hold down elements in a direction disposed at an acute angle to said hold down elements.

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