

Dec. 8, 1942.

R. C. PAULY
RUG CLEANING MACHINE
Filed May 5, 1939

2,304,592

6 Sheets-Sheet 1

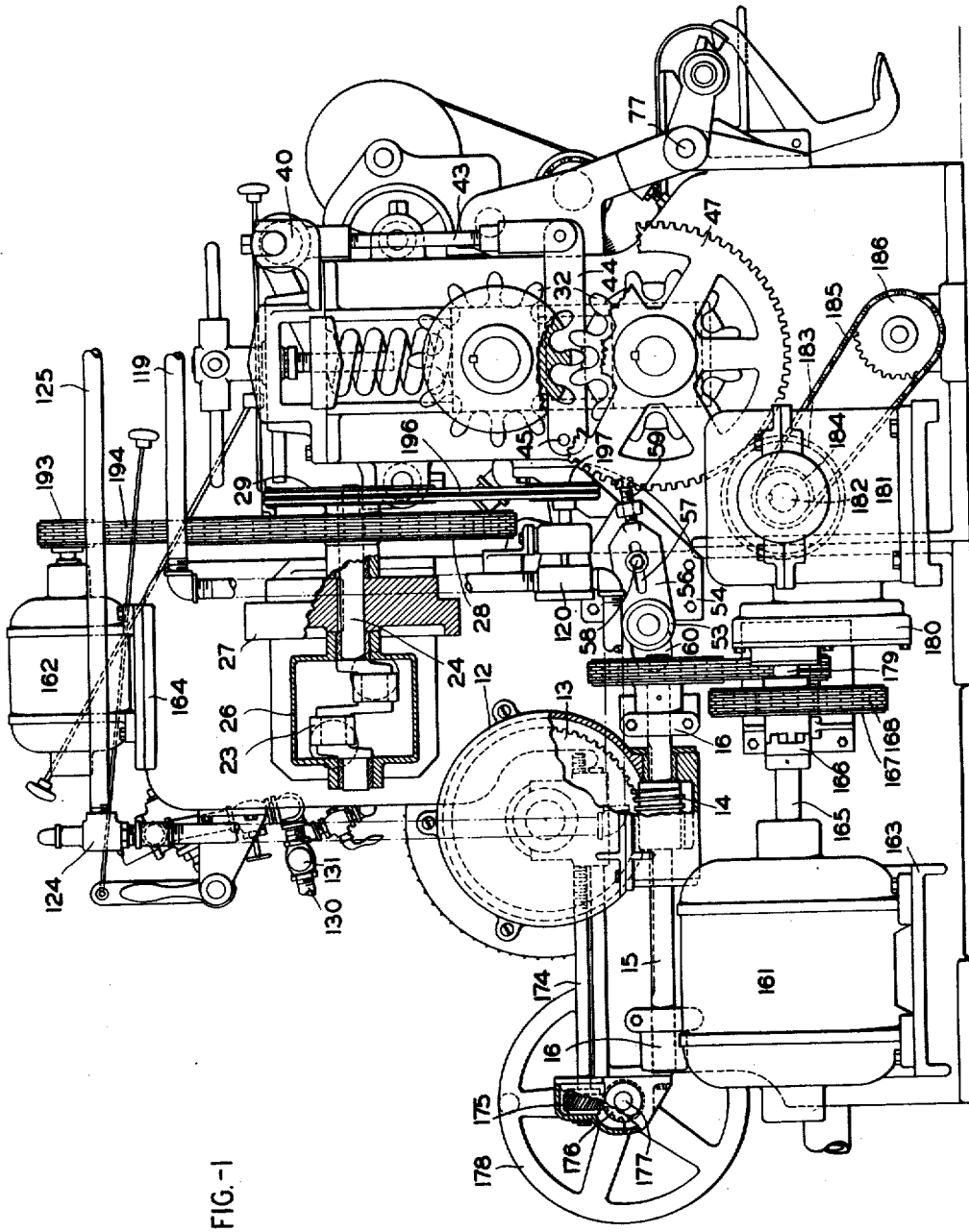


FIG. -1

INVENTOR
ROBERT C. PAULY
BY *Hyde, Higley & Meyer*
ATTORNEYS

Dec. 8, 1942.

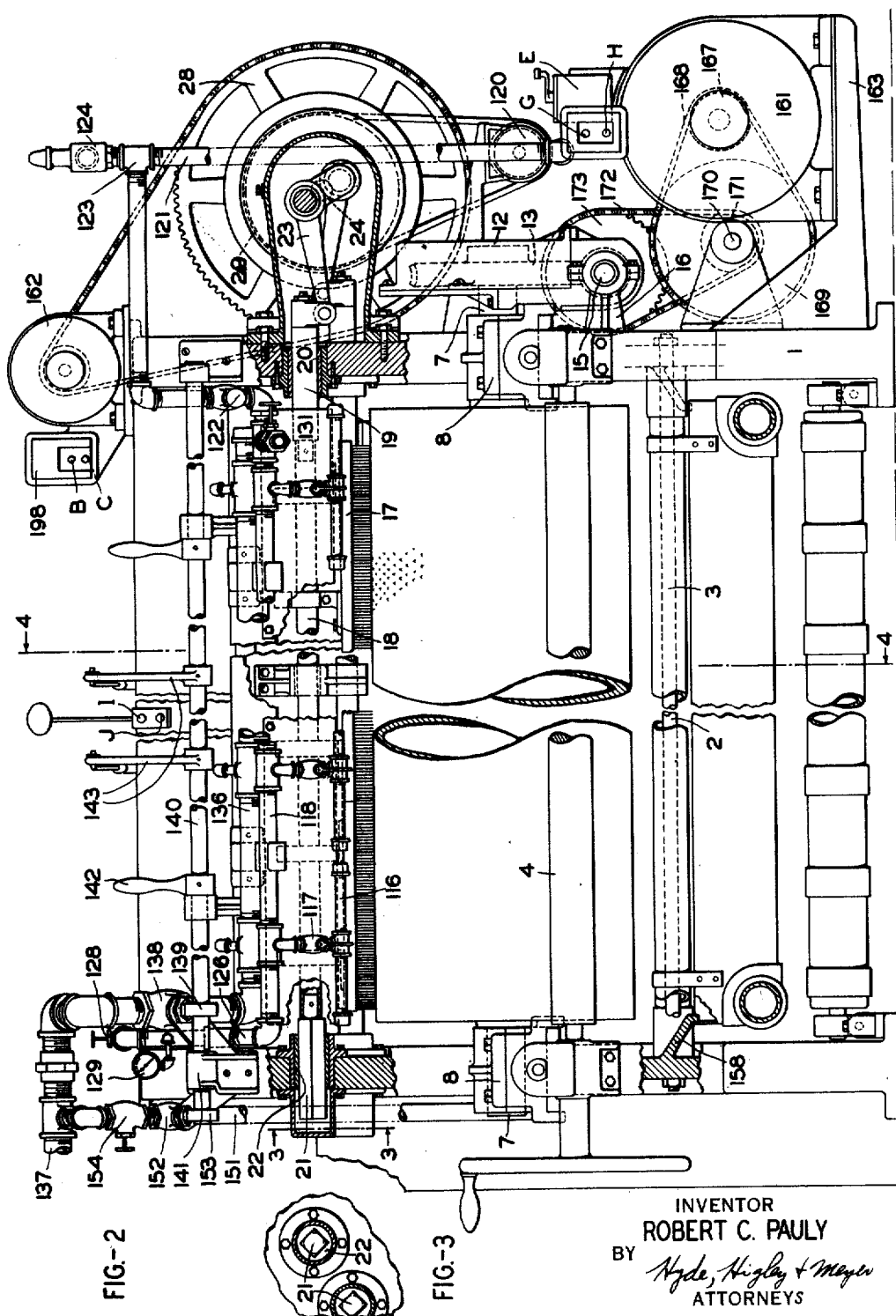
R. C. PAULY

2,304,592

RUG CLEANING MACHINE

Filed May 5, 1939.

6 Sheets-Sheet 2



Dec. 8, 1942.

R. C. PAULY

2,304,592

RUG CLEANING MACHINE

Filed May 5, 1939

6 Sheets-Sheet 3

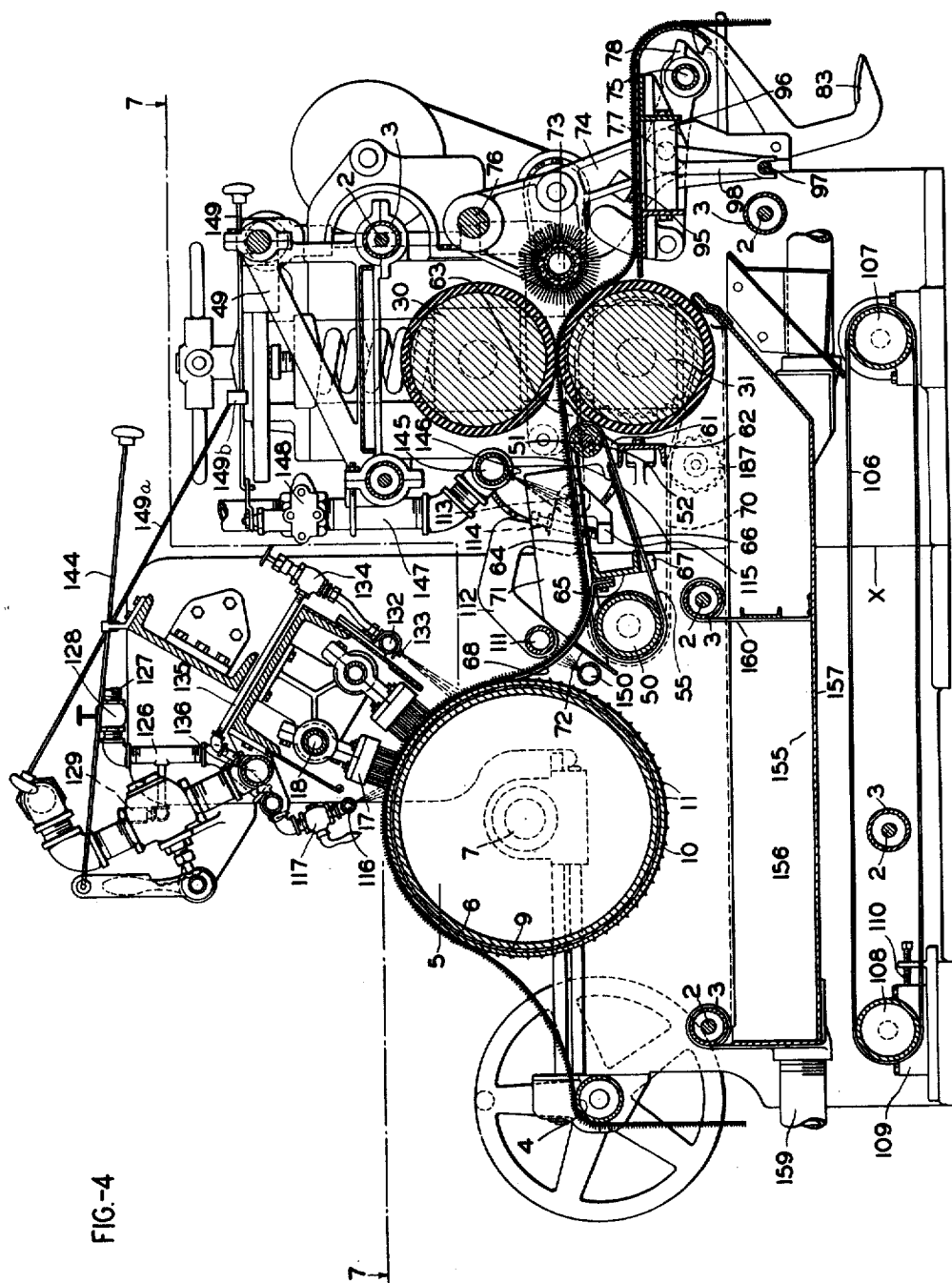


FIG-4

INVENTOR
ROBERT C. PAULY
BY *Hyde, Higley & Meyer*
ATTORNEYS

Dec. 8, 1942.

R. C. PAULY
RUG CLEANING MACHINE

2,304,592

Filed May 5, 1939

6 Sheets-Sheet 4

FIG-6

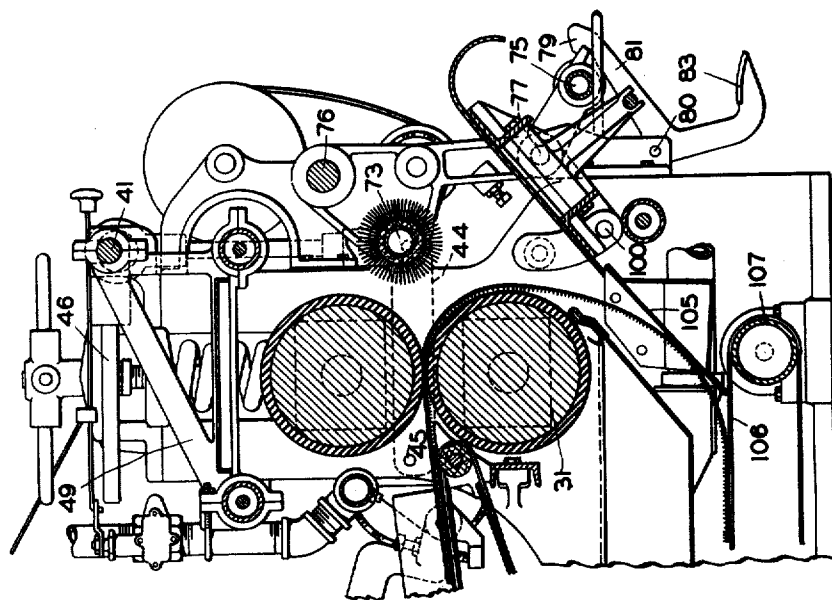
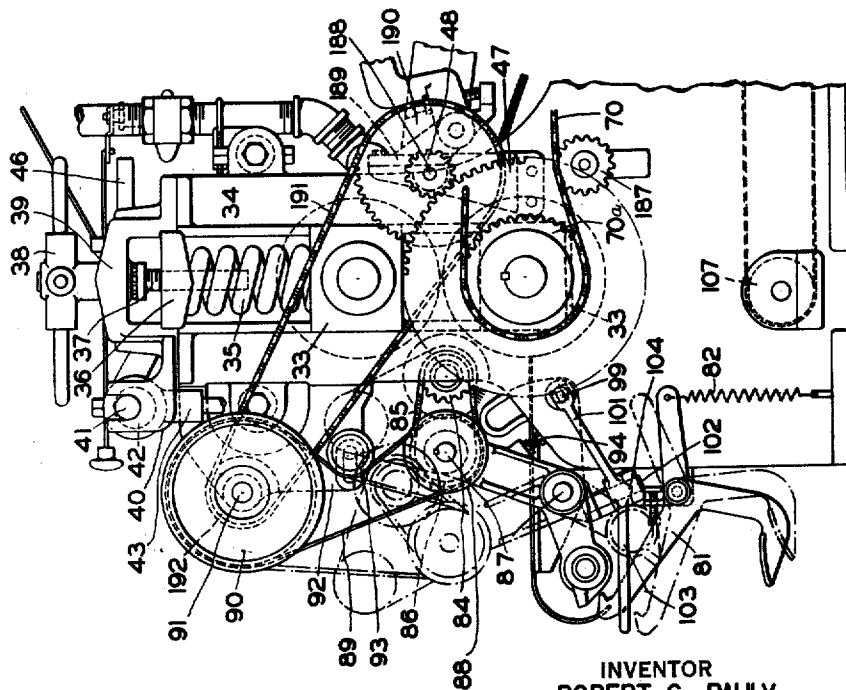


FIG-5



INVENTOR
ROBERT C. PAULY
BY *Hyde, Higley & Meyer*
ATTORNEYS

Dec. 8, 1942.

R. C. PAULY

2,304,592

RUG CLEANING MACHINE

Filed May 5, 1939

6 Sheets-Sheet 5

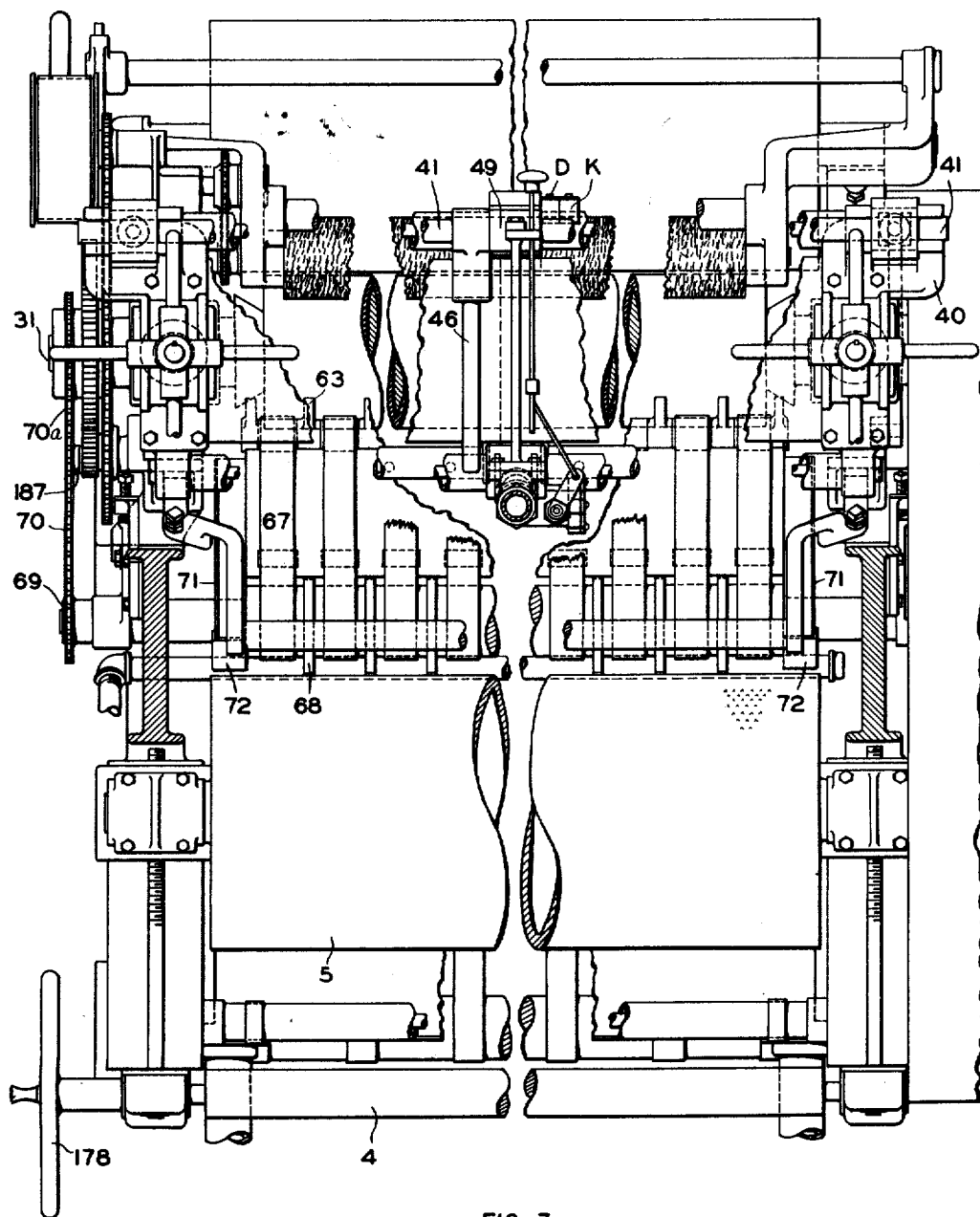


FIG. -7

INVENTOR
ROBERT C. PAULY
BY *Hyde, Higley & Meyer*
ATTORNEYS

Dec. 8, 1942.

R. C. PAULY

2,304,592

RUG CLEANING MACHINE

Filed May 5, 1939

6 Sheets-Sheet 6

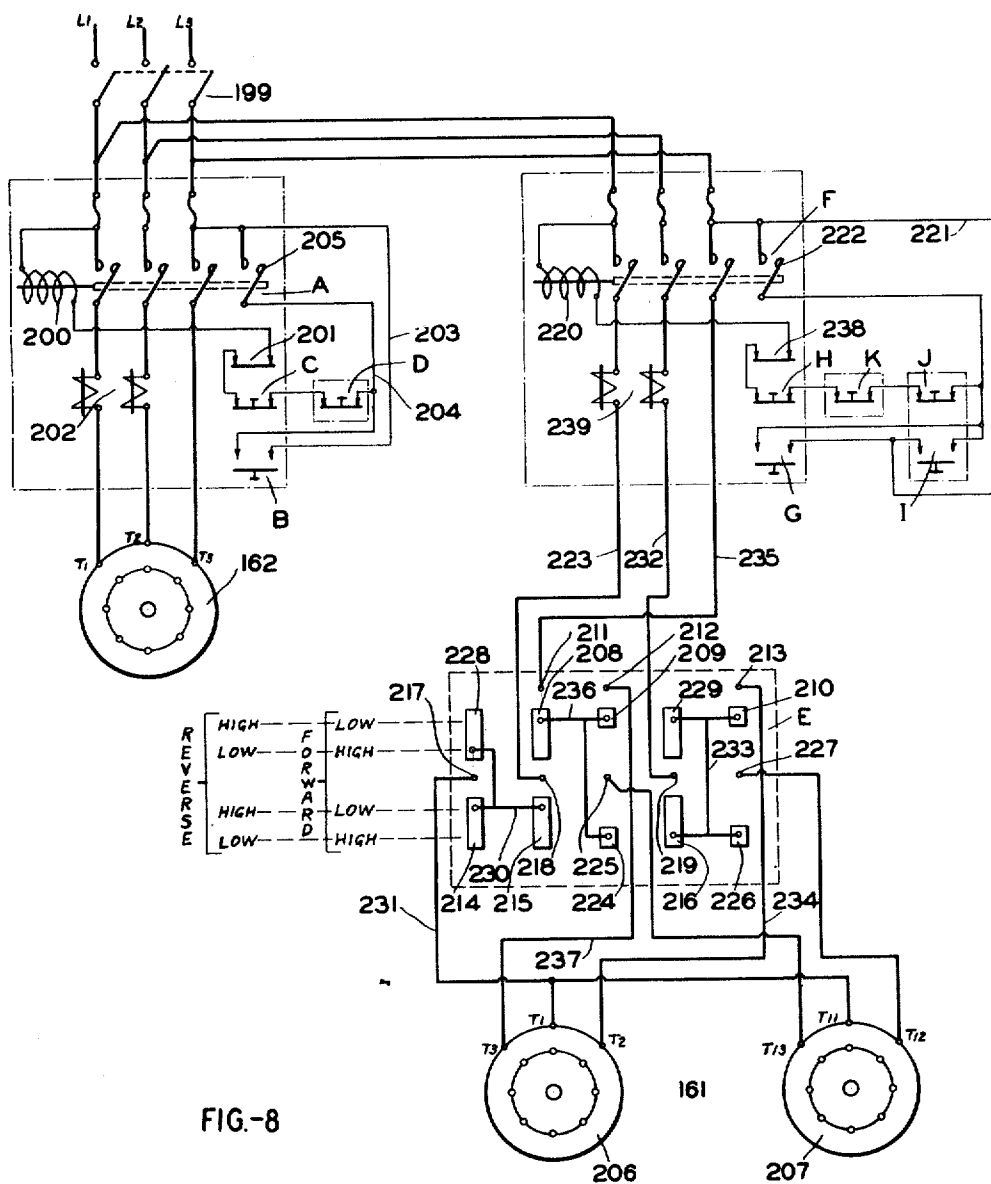


FIG-8

INVENTOR
ROBERT C. PAULY
BY *Hyde, Higley & Mayer*
ATTORNEYS

UNITED STATES PATENT OFFICE

2,304,592

RUG CLEANING MACHINE

Robert C. Fawcett, Cincinnati, Ohio, assignor to
The American Laundry Machinery Company,
Norwood, Ohio, a corporation of Ohio

Application May 5, 1939, Serial No. 271,835

7 Claims. (Cl. 68—22)

This invention relates to machines for cleaning rugs or the like by scrubbing, rinsing, wringing, brushing and like operations.

One object of the invention is to provide a rug cleaning or renovating machine of this class which is improved generally as to its construction, arrangement and association of parts in such manner as to perform its intended duty more thoroughly and efficiently and prevent or reduce possible injury either to the work or to the machine itself.

A further object of the invention is to provide an improved machine of this kind which is capable of convenient adjustment and control by an operator working at various places around the machine, and which is adaptable to various rug textures and types and in a manner to produce the most desirable finish or effect.

A further object is to provide a rug cleaning machine which first scrubs and rinses, and then wrings and brushes the work, the mechanism thereof being organized into two distinct units, one including the scrubbing and rinsing parts and the other including the wringing and brushing parts, the two units being associated for conjoint operation in a manner to produce an improved rinsing effect and to obtain other advantages, including the ability to manufacture, sell and use either of said units independently of the other and to conveniently assemble them as one machine, when desired.

A further object of the invention is to provide a rug cleaning machine which embodies improved scrubbing and rinsing means, the former improved as to the manner of mounting and operating the scrub devices and insuring proper relation thereof to the work, and the latter improved in a manner to apply the rinsing water in streams or sheets moving both with and against rug travel and between them forming a pool or flood with a special rinsing effect, the rinsing means also including means for simultaneously working on both faces of the rug.

Another object of the invention is to provide improved rug conveying means which not only serves to convey the rug into the wringer rolls but also couples together the mechanism of the two machine units before referred to in such manner as to assist in the formation of the aforesaid rinsing pool or flood and in the production of its useful effects.

Still another object of the invention is to provide improved means for maintaining the rug in flat or straight form while travelling through the machine, and especially while moving toward and into the wringer rolls, preventing it from folding over or wrinkling and thus being pressed and delivered in abnormal form.

A further object of the invention is to improve the brushing mechanism so as to prevent or

avoid damage either to the rug or to the machine in case normal rug advance movement is obstructed at or near the brushing devices, and further to enable the brushing roll to be readily adjusted to a position in which it may be conveniently cleaned, and power driven, if desired, while being so cleaned.

Another object is to improve the driving mechanism in a manner to associate the drives for the scrubbing mechanism and for causing flow of soap solution, and independently thereof to associate the drives for other parts of the machine, and in addition to provide for operation of the machine in either direction, forwardly or backwardly, and at different speeds, as well as to enable a rug, at the will of the operator, either to be delivered in finished form or to be returned to the feeding end of the machine for additional treatment.

Further objects of the invention will be apparent to those skilled in the art or will appear more in detail hereinafter.

In the drawings, which represent one suitable embodiment of the invention, including both the cleaning and wringing units before referred to,

Fig. 1 is a side elevation, partly broken out and in section to expose interior parts, looking at that end of the machine which is at the right when standing before it and viewing it as in Fig. 2;

Fig. 2 is a front elevation, also broken out and in detailed section to illustrate interior parts, the central or middle portion of the machine being broken out and omitted to reduce the length of the view;

Fig. 3 is a detail sectional view taken on the line 3—3, Fig. 2, looking in the direction of the arrows;

Fig. 4 is a detail sectional elevation on approximately the line 4—4, Fig. 2, looking in the direction of the arrows;

Fig. 5 is a fragmentary elevation, looking at the machine from the left, and illustrating the wringer, brushing and delivery mechanism;

Fig. 6 is a similar view, partly in section, looking at the right hand side of the machine, and showing the delivery board in position to return rugs to the feeding end of the machine;

Fig. 7 is a sectional plan view taken on approximately the line 7—7, Fig. 4, looking in the direction of the arrows; and

Fig. 8 is a diagram of the electrical control circuits.

The machine shown in the drawings is a complete machine in the sense that it combines in one organized mechanism the two distinct units before referred to. That is to say, the machine illustrated produces a complete rug cleaning operation, including the steps of scrubbing the rug with liquid detergent, such as a soap solution or

other suitable liquid, rinsing the rug by rinsing liquid applied to both of its faces while it is in motion for the purpose of washing out the dirt and detergent liquid, wringing the rug to expel from its fabric as much of the rinsing liquid as is possible, brushing the rug to produce the proper effect upon its nap or exposed wearing surface, either to smooth or to roughen the same as desired, and then either discharging or delivering the rug as a finished piece of work, or at the will of the operator returning it to the feeding end of the machine for further treatment. In one unit are organized the scrubbing and a part of the rinsing devices and for convenience this unit will be referred to as the scrubbing unit. The second unit organizes wringing and brushing devices and additional rinsing devices, being coupled to the first unit not only as to their respective frames, but also by conveying means which plays its part in the production of a rinsing operation, and this second unit, for convenience, will be referred to hereafter as the wringing unit. The two units have independent frames capable of attachment to each other as a single organized machine, but they may be manufactured, sold and used independently of each other, as will be readily understood.

Referring to the drawings, the framework comprises side frames 1 held together by a suitable number of the rods 2 and spaced apart by spacer tubes 3 on said rods.

At the feeding end of the machine, which is at the left in Figs. 1 and 4, it is provided with a transversely extending pipe 4 which forms a support for the rug while applying its leading edge to the feeding roll 5. Said roll is a relatively large cylindrical member, extending the full width of the machine and of large diameter, forming not only means for forcibly advancing the rug into the machine against the scrubbing devices, but also supporting it against the pressure of said devices.

Rug feeding roll

As illustrated the feeding roll consists of a heavy piece of steel pipe 6 having its ends closed and provided with end shaft members 7 mounted in movable bearing blocks 8. The steel pipe-like body portion 6 is completely enclosed within a copper sheet 9 securely fastened thereto, such as by having its ends flanged or turned over the ends of the pipe 6. Over the copper sheet is mounted a non-corrodible covering, such as a Monel metal line plate 10 made of one or several sections. Before application of said plate to the roll it is run through a punch press and small angular projections 11, called tines, are punched out at intervals to provide driving teeth which hold the rug on the roll and enable the roll to forcibly advance and feed it to the scrubbing devices to be later referred to. This arrangement not only provides a satisfactory device for feeding and supporting the rug, but also protects the strong steel body portion of the roll against corrosion.

One of the shaft members 7, that at the right in Fig. 2 extends beyond its bearing block into a casing 12 where it is provided with a worm gear 13. The worm wheel (see Fig. 1), is driven by a worm 14 also contained within the casing 12 and splined to and driven by, but slidable longitudinally along, a shaft 15 supported in bearings 16 and serving as driving means for the feeding roll. This arrangement enables the roll and its driving gearing to be adjusted horizon-

tally transversely to the roll axis without disconnection of the drive, either to advance the roll into proper working relation with the scrubbing devices, or to withdraw the roll for access to its surface for cleaning or other purposes. The housing 12 of course is supported by one of the bearing blocks 8, so that all of the parts described move as a unit with the feed roll during its adjustment.

The scrubbing devices

When the feeding roll is in working position, as shown in Fig. 4, its upper surface is in cooperative relation with the scrubbing devices which are applied to the rug carried on the roll. The scrubbing mechanism includes a suitable number, two being shown, of rows of individual brushes 17, placed end to end and mounted upon and fixed to parallel shafts 18 (Fig. 4). At their right-hand ends (Fig. 2) the shafts 18 are provided with cylindrical portions 19 mounted and endwise movable in bearings 20 on the frame, while at their left-hand ends said shafts are provided with non-circular, such as squared, portions 21 which travel endwise in bearings 22 of the frame. The square shaft portions prevent possible rotation of the shafts and maintain the brushes in alinement and in fixed relation to the rug against the tendency of the travelling rug and rotating feeding roll to rotate said shafts.

Each of the shafts 18, at its right-hand end, is connected by a rod 23 to a crankshaft 24 which, as shown in Fig. 1, is mounted in a suitable bearing bracket and housing 26, the shaft extending through the end of the housing and being provided with a flywheel 27 and beyond it with a sprocket wheel 28 and a pulley 29, later to be referred to.

The wringer mechanism

For convenience, the wringer mechanism will be next referred to. This is more or less of conventional form, comprising a pair of rubber covered upper and lower rolls 30, 31 provided at their right-hand ends with intermeshing driving pinions 32 (Fig. 1) and being mounted in upper and lower bearing blocks 33 slidable in guides in the frames 34, the upper bearing block being sensitive to the pressure of a spring 35, the compression of which may be adjusted by more or less screwing down its cap 36 threaded upon an adjusting screw 37 provided with operating arms 38.

Each frame cap 39 (in which a screw 37 is rotatable) is provided with a laterally and upwardly extending bifurcated arm 40 (see Figs. 1, 5 and 7) which serves as a support for a shaft 41 provided with an eccentric 42 on which is a strap connected by a link 43 to a lever 44 pivoted at 45 on the frame. The two levers 44, one on each side of the frame, lie beneath the movable upper bearing blocks 33, and with some clearance from said bearing blocks (as shown in Fig. 6) when the wringer rolls are in working position. The eccentric carrying shaft 41 extends cross-wise of the machine and at approximately its middle is provided with a lever or handle 46 which normally occupies the position shown in Fig. 7. When at any time, either during an idle period or at the end of a day's operation, it is desirable to separate the rubber wringer rolls, such as for the purpose of preventing the formation of flat spots thereon, the lever 46 is swung over approximately 180°, which turns the eccentrics 42, pulls up on the links 43 and swings the levers 44 upwardly about their pivots, or in

the counterclockwise direction, Fig. 1, thereby lifting the upper bearing blocks 32 and raising the upper rolls 30 away from the lower rolls 31.

The right-hand end of the lower roll shaft is extended and has fixed thereto a gear 47 which meshes with a pinion 48 for driving purposes and later to be referred to. The part 49, Fig. 6, is an intermediate supporting bracket for the shaft 41.

Wringer feeding conveyor

This conveyor (see Figs. 4 and 7) lies between the feed roll and the wringer rolls. Not only does it convey the work toward the wringer rolls, but it also serves to support the rug in inclined position so that a portion of it forms a trough to collect a pool or flood of rinsing liquid. Therefore, since the conveyor is wet during operation, its front roll 50 is provided with a fabricated rubber covering, while the rear roll 51 is made up of a number of individual rubber spools mounted to rotate on a brass rod 52. The front roll 50 is mounted at its ends in bearing blocks 53 (Fig. 1) adjustably mounted each on a bracket 54 mounted on one of the side frames. This mounting is to enable the roll 50 to be adjusted to maintain proper tension of the ribbons 55 connecting the front and rear conveyor rolls. As shown, each bearing block 53 is provided with an arm 56 provided with a slot 57 through which a clamping screw 58 is threaded into the bracket 54, a set screw 59 being provided to properly position the bearing block. The bearing block itself works in a slot 60 of the frame to provide support and facilitate adjustment.

The rear roll 51, 52, is supported by a plurality of brackets 61 mounted upon and distributed at intervals along a cross channel 62 of the frame, each of said brackets having a finger portion 63 which serves as a guide for leading the rug into the bite of the wringer rolls.

The upper stretches of the belts or ribbons 55 are supported by a plate 64 fastened along its front edge to a supporting channel 65 and at its rear edge to the brackets 61. Channel 65 also supports a plate 66 (Fig. 4) lying above the lower stretch of the ribbons 55, as well as a series of belt guides 67 distributed at intervals along the channel and adapted to guide the several ribbons and maintain proper spacing thereof. The channel 65 also supports a series of fingers 68 extending upwardly through the spaces between the ribbons and adapted to rest against the feed roll 6 to guide the rug from the feed roll onto the conveyor.

To drive the conveyor one end of the shaft of roll 50 is provided with a sprocket 69 connected by a chain 70 to drive mechanism later to be described.

71 (Fig. 4) represents a splash guard, one at each side of the machine, each being provided with a wing portion 72 bent over and extending a short distance inwardly toward the center of the machine, as shown in Fig. 7. These splash guards are mounted on the plate 64 and in addition to confining the water coming from one of the spray devices, they also form side walls which tend to confine the flood rinse and prevent water splashing through the side frames. Drainage of the pool or flood or liquid usually takes place over the side edges of the rug and then forward over the plate 64 and into the drainage tub below. The wing portions 72 baffle the water at the extreme side edges of the rug.

Brushing roll

Beyond the wringer rolls 30, 31 and located so that its bristles may be applied to the rug lying upon the surface of the lower wringer roll 31 as it emerges from said rolls, is a brushing roll 73 supported for rotation in arms 74, one on each side of the machine, joined together as a unitary structure by tie bars 75, 76, the upper bar 76 of which is used as a gripper or a hand bar for movement of the brushing roll into and out of brushing position.

The brush roll supporting structure, as a whole, is pivotally mounted in brackets of the frame at 77, the arm 74 on one side of the machine being provided with a lug 78 adapted to be engaged by a latch 79 on one arm of a large lever pivoted at 80 in the frame, so as to hold the brushing roll in inoperative position, as shown in Fig. 6. The lever 81 carrying latch 79 is biased to latching position by a tension spring 82, Fig. 5, but the latch may be released by depressing the foot treadle 83 attached to said lever, whereupon the brushing roll will descend or may be moved down to operative position.

To rotate brush roll 73 its shaft has fixed to it a sprocket 84 connected by a chain 85 to a sprocket 85 mounted on a shaft 87 supported by one of the arms 74. Also fixed to said shaft 87 is a flat-faced pulley 88 connected by a belt 89 to a pulley 90 on a shaft 91 supported by a bracket 92. Pulleys 88 and 90 are flanged to guide the belt and when the brushing roll is in operative position, as in Fig. 5, said belt is tightened by an adjustable idler pulley 93.

When the brush roll supporting mechanism is in the inoperative position of Fig. 6, the belt is loose on the pulley and the brush roll is idle. When the brush roll is moved into working position, as in Fig. 5, the belt becomes tight and produces a drive from pulley 90 to pulley 88. Thus, if there is any obstruction to proper movement or operation of the parts when in working position, such as if the rug or a torn place therein tends to wind around or become entangled with the brushing roll, which might result in damage, the drive belt slips.

The particular drive arrangement is also advantageous because when the brush roll supporting structure is swung forward or to the right from the position shown in Fig. 6, to make it accessible for cleaning, replacement or the like, such as to the position shown in dotted lines, Fig. 5, the belt 89 again becomes taut and produces drive of the brush roll to facilitate its cleaning.

One or both of the arms 74 may be provided with an adjustable set screw 94 (Fig. 5) to limit movement of the brushing roll toward a rug lying upon the lower wringer roll 31.

Rug delivery

As the rug being operated upon passes beyond the brushing roll 73, at the will of the operator it meets either a board or table which delivers it at the delivery end of the machine as a finished product, or a deflector which returns it to the feeding end of the machine for further treatment.

Fig. 4 shows the first arrangement referred to, in which the rug is delivered as a finished product. Beyond the brushing roll the leading end of the rug meets and travels along a delivery plate or board 95 mounted on a frame marked generally 96 pivotally mounted at 77 in brackets of the main frame. A rod 97 extends cross-wide of the frame 96 and under an arm 98 located midway

between the sides of the frame and which serves as a strengthening brace. The table or plate 95 normally lies in the tilted position shown in Fig. 6, being overbalanced in that direction, but it may be tilted by hand to the horizontal position shown in Figs. 4 and 5, in which position it may be held by a latch pin 99 which enters a hole 100 (Fig. 6) in the delivery frame, said pin being mounted on one arm 101 of a lever pivoted at 102 on the main frame and having an operating handle 103. The lower face of the hub of the lever is provided with a lug 104 entering a recess in the supporting bracket, forming a detent to normally hold the pin in its hole.

With the delivery board in the horizontal position shown in Fig. 5, by pressing over the handle 103 the pin 99 may be withdrawn from its hole 100, and the delivery board will drop to the position shown in Fig. 6.

In this position the rug is not discharged at the delivery end of the machine, but its leading end descends, moving past the delivery table until it meets an inclined guiding plate 105, Fig. 6, which directs the rug downwardly upon the upper surface of a return delivery conveyor, comprising a series of spaced ribbons 106 supported by a rear roll 107 and a front roll 108, the latter being supported in bearing blocks 109 provided with adjusting means, such as the screw 110, by means of which the tension of the ribbons 106 may be adjusted.

The rug delivered to the return conveyor is returned to the front of the machine where it is accessible to the operator and in position to be readily fed again to the feed roll 6 for conveyance through the machine and subjection of the work to any or all of the renovating steps, as before.

Rug straightening bar

Just above the rug travelling through the machine, where it lies on the fingers 66 which guide it to the feeding belt, is located a transversely extending rod or pipe 111, Fig. 4. This extends the full width of the machine, its opposite ends being fixed to arms 112 pivoted at 113 in brackets mounted on the side frames. An adjustable set screw 114 engages a fixed stop 115 to limit downward movement of rod 111.

In operation, this rod lies just above the rug, with a slight clearance from its upper surface, and fairly close to the feed roll 6. If the trailing edge of the rug, as it emerges from between the feed roll and scrubbing brushes, falls over, it engages over the said bar 111, and said bar guides or straightens the rug as it continues its movement. This bar therefore prevents any possibility of a turned over edge of the rug from so passing into the wringer rolls, and it also prevents the rug from wrinkling between its edges.

Detergent supply system

Any suitable detergent, such as liquid soap or a soap solution, is applied to the surface of the rug just before it reaches the first row of scrubbing brushes 17. This detergent, hereafter referred to generally as the solution, is discharged upon the rug in small streams through spaced perforations in each of a series of short sections of pipe 116 each controlled by a manually operated regulating valve 117. The several pipes 116 are arranged end to end, as shown in Fig. 2, and several are used so that soap may be supplied to less than the entire width of the machine, either to one side or the other, or in the center, in accordance with the width of the particular

rug being treated. All of the pipe sections 116 are supplied from a header pipe 118.

The soap solution is pumped from a supply tank, not shown, by way of a pipe 119 to the intake side of a rotary pump 120 (see Figs. 1 and 2), the delivery side of which communicates with pipe 121 leading to the header 118 by way of a main shut off valve 122. A T 123 in pipe 121 communicates with an adjustable relief valve 124, the discharge side of which communicates by a pipe 125 (Fig. 1) with the storage tank from which the solution is withdrawn.

The far end of the header 118 also returns to the solution tank by way of pipes 126, 127, in the latter of which is an adjustable solution pressure control valve 128, and connected to the system, such as to pipe 126 is a pressure gauge 129, ahead of the valve 128.

In operation the relief valve 124 is set to any suitable maximum value of pressure, say five pounds. The pump 120 operates continuously, so that if it is desired to fully cut off the solution supply by closing the main valve 122, the excess pressure built up by the pump is relieved at the valve 124 and all solution is returned to the solution tank.

If, for any other reason, during the operation, pressure builds up to any excess of five pounds, the excess is likewise relieved and returned to the solution tank through valve 124, thus maintaining the desired maximum pressure, say five pounds. This pressure is indicated on the pressure gauge 129. If it is desired to reduce the pressure below that for which the relief valve is set, valve 128 may be more or less opened to permit relief and return flow through the pipe 127, and by adjusting valve 128 and noting the reading of the gauge any desired pressure, even beneath five pounds, may be secured and maintained.

The header 118 is preferably also provided with connections to another pipe 130 by way of a valve 131 (Fig. 1). Pipe 130 may be connected, for example, to a supply of water under pressure which may be used for cleaning out any one or all of the individual solution headers or used for any purpose requiring the introduction of water to the solution supply system.

Rinsing

Rinsing of the work after it has been scrubbed with detergent solution by the two rows of reciprocating brushes 17, after delivery of solution to the rug surface, is accomplished by any suitable rinsing means, such as clear water, either hot or cold, as desired.

The first rinsing operation is performed by a plurality of short water supplying headers 132 (Fig. 4) spaced along the machine end to end, similarly to the soap headers, and provided with spray nozzles 133 spaced at intervals to produce substantially a sheet of water extending cross-wise and directed downwardly upon the rug surface. Each individual water header is under the control of its own valve 134, so that as many individual spray headers may be put into service as the width of the work requires, as in the case of the soap headers.

The several water headers are connected by pipes 135 with a main water supply header 136, which is connected to a main water supply pipe 137 by way of a control valve 138, the stem of which is operated by a cam 139 on a shaft 140, extending cross-wise of the full width of the machine, and supported in suitable bearings 141

and provided with one or more operating handles 142 for control of the water line from the front of the machine. By grasping a handle and turning the shaft one way or the other, the valve 138 is opened or closed as desired. Handles 142 are accessible to an operator standing in any position at the front of the machine, and another pair of levers 143 is connected to said shaft and is provided with rods 144 extending to the rear of the machine and accessible to an operator there, so that the first rinse headers may be conveniently controlled by an operator anywhere around the machine.

The second rinse is with the same liquid, for example, water, delivered upon the surface of the rug by a single pipe 145 extending the full width of the machine and provided with spaced supply nozzles 146 like the nozzles 133 before referred to. While this pipe may be sectional, it is shown as a single pipe connected directly to the water supply by a pipe 147 under the control of a single valve 148 operable by a rod 149 extending to the rear or delivery end of the machine, or by a rod 149a connected at 149b to rod 149 and extending to the front of the machine.

A third rinse is supplied to the back of the rug, that is, to its under surface, by openings in or nozzles spaced along a single pipe 150 located beneath the rug close to the feed roll 6 and connected into the main water supply by way of a pipe 151 under the control of a valve 152 operated by a cam 153 on the same shaft 140 before referred to and therefore controlled by the same operating levers 142, 143. This may be a sectional pipe but is shown as a single pipe spraying over the entire width of the machine. The supply to the back rinse pipe may also be controlled by a hand valve 154 ahead of the valve 152, to completely shut off this rinse if desired.

The fourth rinse to which the work is subjected is what may be termed a flood or pool rinse, produced by a mass of rinsing liquid collected in a natural trough formed by the rug and its supporting devices as the rug moves from the feeding roll 6 to the wringer rolls, and as it is supported by the downwardly inclined fingers 68 and the upwardly inclined wringer feed conveyor. The formation of this pool or flood of liquid is supplemented by a damming effect produced by the two walls of water formed respectively by the spray streams of the first and second rinse pipes 132, 145, which are directed upon the rug respectively in the same direction as, and in a direction opposed to, that of rug movement. In other words, the water discharged from the pipe 132 flows along with the roll and the following water builds up a wall behind it, while the water delivered by the nozzles in pipe 145 flows backwardly along the rug, with a wall of water formed by the water following it, and the two walls together produce and confine the pool between them.

Drainage system

The rinse water discharged from all rinse lines upon the rug is delivered to a tub or basin located beneath the feeding and wringer rolls and extending from side to side of the machine. The tub shown comprises a shallow tank 155 (Fig. 4) having side walls 156, an open top, and a bottom 157. The side frames of the machine are provided with extensions 158 (Fig. 2) over the side walls of the tank and direct any water or solution from the side frames into the tank. Suitable drainage connections may be provided for

said tank, such as pipes 159 connected to one or any of the corners of the tub. The tub may be supported in any suitable manner, such as by straps 160 fastened around certain of the frame spacers 3.

Drive mechanism

The various parts of the mechanism of the machine are driven by two independent electric motors 161, 162, the former mounted upon a bracket 163 attached to one of the side frames and the other upon a platform 164 at the top of the machine. Motor 162 operates the scrubbing brushes and the pump for supplying detergent liquid and motor 161 operates all other parts of the mechanism, of course including all parts which produce or affect movement of the rug through the machine.

As shown in Figs. 1 and 2, motor 161 has its shaft 165 connected by a coupling 166 to the shaft of a sprocket wheel 167 from which a chain 168 extends to a sprocket 169 on a shaft 170 having a sprocket 171 connected by chain 172 to a sprocket 173 on the shaft 15 carrying the worm 14 for rotating the rug feeding roll 6, thus providing a drive for the feed roll.

To adjust the feed roll fore and aft, or into and out of cooperating relation with the scrubbing brushes 17, its bearing members 8 are provided with threaded openings to receive longitudinally extending shafts 174 (Fig. 1), each provided with a spiral gear 175 meshing with a corresponding spiral gear 176 on a transverse shaft 177 provided with an operating hand wheel 178, and upon which shaft 177 is mounted the pipe or roll 4 before referred to.

The shaft 179 supporting the pinion 167 extends into one side of the gear box 180 of a speed reducing transmission unit 181 having a shaft 182 which has keyed thereto a gear 183 meshing with and driving the gear 47 which actuates the wringer rolls.

Also fixed to the transmission shaft 182 is a sprocket wheel 184 connected by a chain 185 to a sprocket 186 on the shaft of roll 107, which provides a drive for the return conveyor 106.

To drive the wringer feed conveyor, a sprocket 70a is fixed on the gudgeon shaft on one end of the lower wringer roll 31 (see Figs. 5 and 7), which is connected by the chain 70 to the sprocket 69, said chain travelling over an adjustable idler sprocket 187 to regulate the chain tension.

To drive the brush roll 73, the shaft of the lower wringer roll is provided with the gear 47 before referred to, meshing with a pinion 48 on a shaft 188 mounted on bracket 189, said shaft being provided with a sprocket wheel 190 connected by a chain 191 with a sprocket 192 on the shaft 31 before referred to. Thus, driving movement is imparted to the shaft 31 and thence through the belt 89, shaft 87 and chain 85 to the brush roller.

The motor 162 has its shaft provided with a pinion 193 connected by a chain 194 with the sprocket 28 on the crankshaft 24 on which the flywheel 27 is mounted (Fig. 1). Rotation of said shaft, through its cranks, provides alternate reciprocating motion to the two rows of scrubbing brushes 17. Fixed to the extreme end of the shaft 24 (that end on the far side of the sprocket 28 from the cranks) is the pulley 29, connected by a V-belt 196 to a pulley 197 on the pump shaft, thus providing drive for the pump which supplies detergent liquid.

Electrical control system

Fig. 8 illustrates the electrical control system, with the motor 161 diagrammatically illustrated twice for convenience in explanation of its forward and reverse operations. The control system for motor 162 includes a magnetic switch, marked generally A, push button switches B, C, physically located adjacent the motor, at the top of the machine, in a housing 198 (Fig. 2) and accessible at the feeding end of the machine, and a push button switch D located at the rear of the machine as shown in Fig. 7.

B is a normally open starting button and C a normally closed stop button, controlled from the front of the machine, and D is a normally closed stop button controlled from the rear of the machine.

To start motor 162 the switch B is closed, establishing a starting circuit from L₁ through line switch 199, coil 200 of magnetic switch A, conventionally reset switch 201 (associated with over-load release coils 202 and operated by the button of switch C) and by way of switches C, D, B and wire 203 to L₃. Energization of coil 200 closes magnetic switch A and establishes the usual maintaining circuit for coil 200 by way of wire 204 and the now closed contactor 205 of the switch A. The motor may be stopped by opening either of the switches C or D to deenergize coil 200 and permit switch A to open.

Motor 162 is a single speed unidirectional motor. Motor 161 however is of the two speed reversing type. For speed control its frame contains a low speed winding diagrammatically illustrated at the left at 206 and a high speed winding 207. Reversing is controlled by a manually operated drum switch E conventionally shown in Fig. 8 and which is physically located at one side near the feeding end of the machine, as shown in Fig. 2. The control for this motor also includes a magnetic contactor switch F, a starting push button G, and a stop push button H, both located adjacent switch E near the front of the machine, a starting push button I and a stop push button J located at the center of the machine near the top, as shown in Fig. 2, and a stop push button K located at the rear of the machine adjacent switch D, as shown in Fig. 7. To operate motor 161 at low speed in the forward direction, the rotatable member of the drum switch is turned to a position to connect its segments 208, 209, 210 with terminals 211, 212, 213 respectively, and to connect its segments 214, 215 and 216 with terminals 217, 218 and 219 respectively. One of the starting buttons, either G or I, is then closed, establishing a starting circuit through the coil 220 of the magnetic switch F from L₁ by way of wire 221 to L₃, as in the case of the motor 162, a maintaining circuit being likewise established through the contactor 222 of the magnetic switch, when it closes.

With the switch F closed, a circuit is established from L₁ by way of wire 223, terminal 218, segment 215, wire 230, segment 214, terminal 217 and wire 231 to terminal T₁ of the winding 206. L₂ is connected by wire 232, terminal 219, segment 216, wire 233, segment 210, terminal 213 and wire 234 to terminal T₃ of the winding. L₃ is connected by wire 235, terminal 211, segment 208, wire 236, segment 209, terminal 212 and wire 237 to T₂ of the winding.

To operate the motor 161 at high speed in the forward direction, the drum switch is moved farther in the same direction to connect segment

208 with terminal 211, and to connect segments 214, 215, 224, 210 and 226 to terminals 217, 218, 225, 219 and 227 respectively. L₁, L₂ and L₃ are now connected respectively to the terminals T₁₁, T₁₂ and T₁₃ of winding 207 of the motor.

If low speed in the reverse direction is desired, the drum switch is moved in the opposite direction to a position in which segments 228, 208 and 229 are connected respectively to the terminals 217, 218 and 219, and segments 215, 224 and 226 are connected respectively to the terminals 211, 212 and 213. With this arrangement L₁, L₂, L₃ are now respectively connected to the terminals T₃, T₂ and T₁ of the winding 206.

To operate the motor at high speed in the reverse direction, the drum switch is moved still farther to connect segment 215 to terminal 211 and the segments 228, 208, 209, 229 and 210 respectively to the terminals 217, 218, 225, 219 and 227. L₁, L₂ and L₃ are now respectively connected to the terminals T₁₃, T₁₂ and T₁₁ of the winding 207 of the motor.

Closing of the contactor switch F is effected by energization of coil 220. As in the case of motor 162 this coil is energized by depressing either of the starting buttons G or I. The control circuit is maintained through the finger 222 of switch F, when said switch becomes closed, and switch F may be opened by depressing any one of the stop buttons H, K or J. 238 is a reset switch associated with the over-load release coils 239, similar to the switch 201, and in this case operated by the push button of switch H.

General operation of machine

The proper setting of the feed roll 6 relative to the scrubbing brushes is first of all selected and accomplished according to the type of rug to be cleaned. This is accomplished by appropriate manipulation of the hand wheel 178. While the adjusting motion of roll 6 is not truly radial in its relation with the brush and rolls, departure from radial motion is so slight as to be negligible and proper relation between the brushes and the carpet on the roll is readily obtainable.

If proper treatment of the rug requires brushing after wringing, the brushing roll 73 is moved into the operative position shown in Fig. 4, which is accomplished by depressing the foot treadle 63 to release the latch 79. This operation makes the belt drive for said drum effective, with the ability to slip in case an obstruction is encountered.

The individual valves 117 for the several soap supply headers are selectively opened according to the width or span of the rug to be cleaned. Where possible, several small rugs may be fed simultaneously alongside of each other or of a larger rug, in which case all of the header valves may be opened. Also, the several valves 134 of the individual rinse headers are likewise opened, according to the desired rinsing span.

The drum switch E is now set for the desired forward speed, either low or high, as may be desirable. Motor 161 is now energized by depressing either one of the starting buttons G or I, which sets the feed roll, the wringer feed conveyor, the wringer rolls, the return conveyor and the brushing roll into operation.

Next, motor 162 is energized by depressing starting button B, setting the scrubbing unit, including both rows of brushes, and the detergent supply pump into operation. The main soap supply valve 122 is now opened and any one of the

several levers or rods is operated to open the main rinse valve 138, supplying water to the first rinse line, and the valve 182 supplying water to the back rinse line. Also, by operation of the appropriate rods, the valve 148 is opened, supplying water to the second rinse line.

The rug or rugs to be cleaned are now applied to the feed roll 6, being carried along by its tines, as the roll rotates, so as to move the rug under the two rows of reciprocating brushes. As the work moves into the brush unit the detergent liquid is delivered to its upper surface through the several headers 116 and when it reaches the brushes it is thoroughly scrubbed in a manner to open up the fibres and break up and loosen dirt and foreign material so that it is subject to the detergent effect of the liquid supplied to it.

As the rug emerges from the brushing zone it is first spray rinsed by the several streams of water coming from the first rinse line. This rinsing water is delivered to the rug as it is moving down along the back of the roll, so that the water flows upon it with or in the direction of rug travel. The rug is directed by the several guide fingers 68 beneath the straightening bar 111 and upon the surface of the moving conveyor. In its travel to the conveyor it is back rinsed from the header 150. In its continued travel it is again spray rinsed by the streams coming from the second spray header 145, the water being delivered to it in a direction contrary to its direction of travel. The trough formed by the rug travelling down along the fingers 68 and upwardly with the conveyor, together with the walls formed by the sheets of water ejected at the first and second rinses, give the rug surface a pool or flood rinse, the water flowing off at the ends and down to the drainage tub.

The conveyor directs the rinsed rug into and between the two wringer rolls, the pressure between which is adjusted so as to squeeze out and discharge the water, reducing the moisture content of the rug to the desirable value. Beyond the wringer rolls the rug meets the brushing roll 73 which produces the desired finish to its nap. As the rear edge of the rug passes beyond the second row of scrubbing brushes, any tendency of that edge to turn over is taken care of by the straightening bar 111 which also prevents formation of wrinkles.

Ordinarily, unless the rug is not greatly soiled, it is fed into the machine with the back side facing upwardly and the scrubbing and rinsing operations are performed on this side first. This step is usually conducted at high speed operation of motor 161. In this case, the delivery board 95 is tilted to the position shown in Fig. 6, and the rug, instead of moving over the delivery board for discharge out of the machine, continues downwardly and is directed by the chute 105 upon the return conveyor and is returned to the front of the machine, where it is re-fed, with the pile side up and at slow speed operation. Upon completion of the first run, and before the rug comes through again, the delivery board is returned to the delivery position of Fig. 4, unless it is desired to re-run it with the pile side up, which is sometimes necessary in the case of a very soiled rug.

In some instances a rug may be very soiled at certain points. In this case the very soiled part is fed under the scrubbing brushes and then motor 161 is reversed, to move the rug backwardly, either at low or high speed, and the same part is subjected to repeated scrubbing.

The low speed operation is also very frequently

used when a rug is very much worn or has a flimsy body.

Whether to feed the rug with the pile pointing in the direction of or contrary to the direction of movement of a rug is a matter of the type of the rug and the finish which it is desirable to effect by the brushing roll. Where the brushing roll is used and a smooth finish is desired, the rug is fed with the pile pointing in the direction of travel, but if a rough finish is desired it is fed with the pile pointing in the opposite direction. In either case, the first and second rinses always eject their rinsing streams one with and the other against the direction of the pile.

If the machine is to be idle for any appreciable length of time the tension of the wringer springs 35 is slackened off, and lever 46 is rotated clockwise to a position 180° from that shown in Fig. 6, which raises the upper wringer roll away from the lower roll, thereby preventing the formation of flat spots on the rubber covering of the rolls.

Driving motor 161 may be stopped from any one of three positions, either by the stop button at the right front of the machine, by the switch J at the front center of the machine or by the switch K at the rear of the machine.

The motor 162 may be stopped by the push button C at the front of the machine or by the push button D at the rear of the machine.

The machine described is capable of convenient operation and control and when built to include both the cleaning and the wringing and brushing parts, will completely renovate a rug. But, as before referred to, the machine is built in a manner to include two distinct units, to wit, the unit at the right in Fig. 4 including the wringer rolls and brushing roll 73, and if desired the conveyor belts leading to the wringer rolls, the other unit including the feeding roll 6, the scrubbing brushes, the return conveyor, the circulation systems for detergent and water—in fact, all parts having to do with the rug cleaning operation as distinct from its drying and surface finishing. Either of these two units may be sold and used by itself. For example, the operator may first buy and use the wringing and brushing unit alone, cleaning and rinsing the rug in any suitable manner, either on the floor or in tanks, and then passing it through the wringer and brushing rolls for the drying and finishing operations, later completing the machine by the addition thereto of the earlier unit, including the cleaning parts referred to.

The frames of the two units of the machine separate from each other and are joined together along a transverse vertical plane represented by the vertical line marked X in Fig. 4, securement of the two units together being accomplished by bolts (not shown) extending through aligned openings in flanges of the two frame members.

Of course, when the wringing unit is sold alone it includes no return conveyor 106 or driving mechanism therefor, although the frame will include the necessary parts and openings for attaching supports and bearings when these parts are added, as will be readily understood. Also, the wringer unit alone includes the second rinsing line 145 and the controls therefor, and the feeding conveyor 55 for the wringer rolls. The bracket 54 for supporting this feeding conveyor, when the wringer unit alone is sold, is of the same construction illustrated in the drawings, so far as support and adjustment of the conveyor are concerned, but its base portion is modified in shape for attachment to and support by the face of the

wringer frame, and when a scrubbing unit is assembled therewith replacement brackets of the form shown in the drawings are substituted for those originally included.

Again, the wringer unit, when sold alone, is usually equipped with any suitable form of finger guard (not shown) located at the entrance to the wringer rolls and adapted when engaged by the fingers in any manner which might subject them to injury, to open a switch in the control circuit and stop or reverse the power drive, to safeguard the operator. This feature forms no part of the present invention.

Further, in the machine shown in the drawings the driving motor 161 and speed reducing unit 161 are supported by brackets 163 attached to the frames of the two units. When the wringer unit alone is sold said motor and the speed reducing unit are closer together and mounted on the frame of the wringer unit. Addition of the scrubbing unit involves either rearrangement of the motor and speed reducing member 161 and reorganization thereof with the drive for the scrubbing unit, but in some cases it is more convenient to take off the original motor and speed reducing unit and substitute for them the ones shown in the drawings.

Other advantages will be apparent to those skilled in the art.

What I claim is:

1. In a rug cleaning machine, the combination of means for feeding a rug generally horizontally along a path, means for directing separate streams of rinsing liquid to the rug surface and toward each other at points spaced along said path, one stream being inclined to the rug surface forwardly and the other rearwardly along said path, thereby to form and collect upon the rug surface a pool of rinsing liquid, and rug supporting means between said streams having a portion concave upwardly causing the rug to form a transversely extending trough within which said pool is collected.

2. In a rug cleaning machine, the combination of means for feeding a rug generally horizontally along a path, means for directing separate streams of rinsing liquid to the rug surface and toward each other at points spaced along said path, one stream being inclined to the rug surface forwardly and the other rearwardly along said path, thereby to form and collect upon the rug surface a pool of rinsing liquid, wringing means beyond the second of said streams, rug supporting means beyond the first stream having a portion extending downwardly, and conveying means extending upwardly from said supporting means to the wringing means and with said supporting means causing the rug to assume the form of a trough to collect said pool.

3. A rug cleaning machine, comprising two cooperatively related units, one unit including a frame, scrubbing means and rug feeding means therefor mounted in said frame, the other unit including a frame separably connected to the first named frame, wringing means mounted therein, conveying means extending from the scrubbing means in one frame to the wringing means in the other frame, unidirectional motor means for operating said scrubbing means, and an independent reversible variable speed motor

for operating said wringing and rug feeding means, both motor means being mounted in the first named frame, whereby the first named unit with its scrubbing, rug feeding and motor means is usable either alone or with the second unit connected thereto.

4. A rug cleaning machine, comprising two separably connected units, one unit including a frame, scrubbing means and rug feeding means therefor mounted in said frame, the other unit including a frame and wringing means mounted therein, means for guiding and conveying the rug from said rug feeding means to said wringing means and arranged to permit a portion of the rug to travel downwardly and then upwardly from frame to frame, whereby to form a transversely extending trough, and means for supplying rinsing liquid to the rug adjacent the trough therein to thereby subject its upper surface to a pool rinsing effect, unidirectional motor means for operating said scrubbing means, and an independent reversible variable speed motor for operating said wringing and rug feeding means.

5. A rug cleaning machine, comprising two separably connected units, one unit including a frame, scrubbing means and rug feeding means therefor mounted in said frame, the other unit including a frame and wringing means mounted therein, means for guiding and conveying the rug from said rug feeding means to said wringing means and arranged to permit a portion of the rug to travel downwardly and then upwardly from frame to frame, whereby to form a transversely extending trough, and means mounted in each frame for directing two sheet like streams of rinsing liquid upon the rug, the two said streams being directed upon opposite sides of said trough and being inclined toward each other to assist in the formation of a rinsing pool therein, unidirectional motor means for operating said scrubbing means, and an independent reversible variable speed motor for operating said wringing and rug feeding means.

6. A rug cleaning machine, comprising a rotatable work feeding member of drum form, reciprocable scrubbing members movable endwise thereof, liquid supplying conduit means having portions provided with opposed liquid emitting passages for applying a sheet like stream of rinsing liquid to that portion of the rug lying on the descending drum surface, downwardly inclined, rug supporting means beyond said rinsing means and disposed in the path of travel away from said drum for causing the rug to travel downwardly, and upwardly inclined conveyor means beyond said downwardly inclined rug supporting means, whereby a portion of the rug assumes concave trough like form and collects a pool of the rinsing liquid.

7. A rug cleaning machine of the class described, including a rotatable rug feeding roll, movable scrubbing members cooperating therewith, detergent feeding means, wringing means, a conveyor for advancing the work from said feeding roll to said wringing means, unidirectional motor means for operating said scrubbing and detergent feeding means, and an independent reversible variable speed motor for operating said rug feeding and wringing means.

ROBERT C. PAULY.