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Gregg

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[54] **APPARATUS FOR SCOURING AND BLOOMING PILE CARPET**

[75] Inventor: **Rodman I. Gregg,** Wilmington, Del.

[73] Assignee: **Hercules Incorporated,** Wilmington, Del.

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[58] **Field of Search** ..... 68/62, 9, 27, 175, 68/13 R

[56] **References Cited**

UNITED STATES PATENTS

617,561	1/1899	Butterworth	68/9
1,741,338	12/1929	Rowley et al.	68/62 X
3,440,842	4/1969	Pace	68/62 X
3,589,147	6/1971	Price	68/62 X

FOREIGN PATENTS OR APPLICATIONS

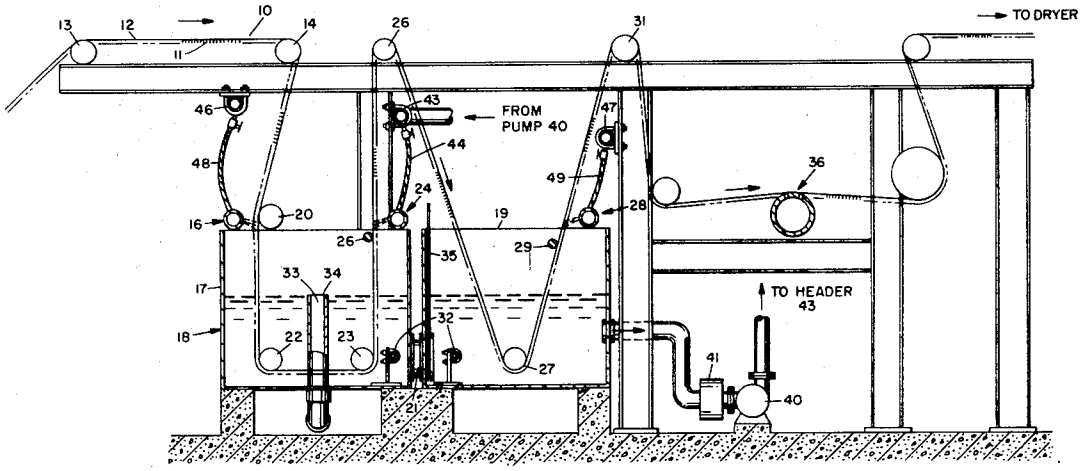
959,200	5/1964	Great Britain	68/9

Primary Examiner—William I. Price
Attorney—Stanley A. Becker

[57] **ABSTRACT**

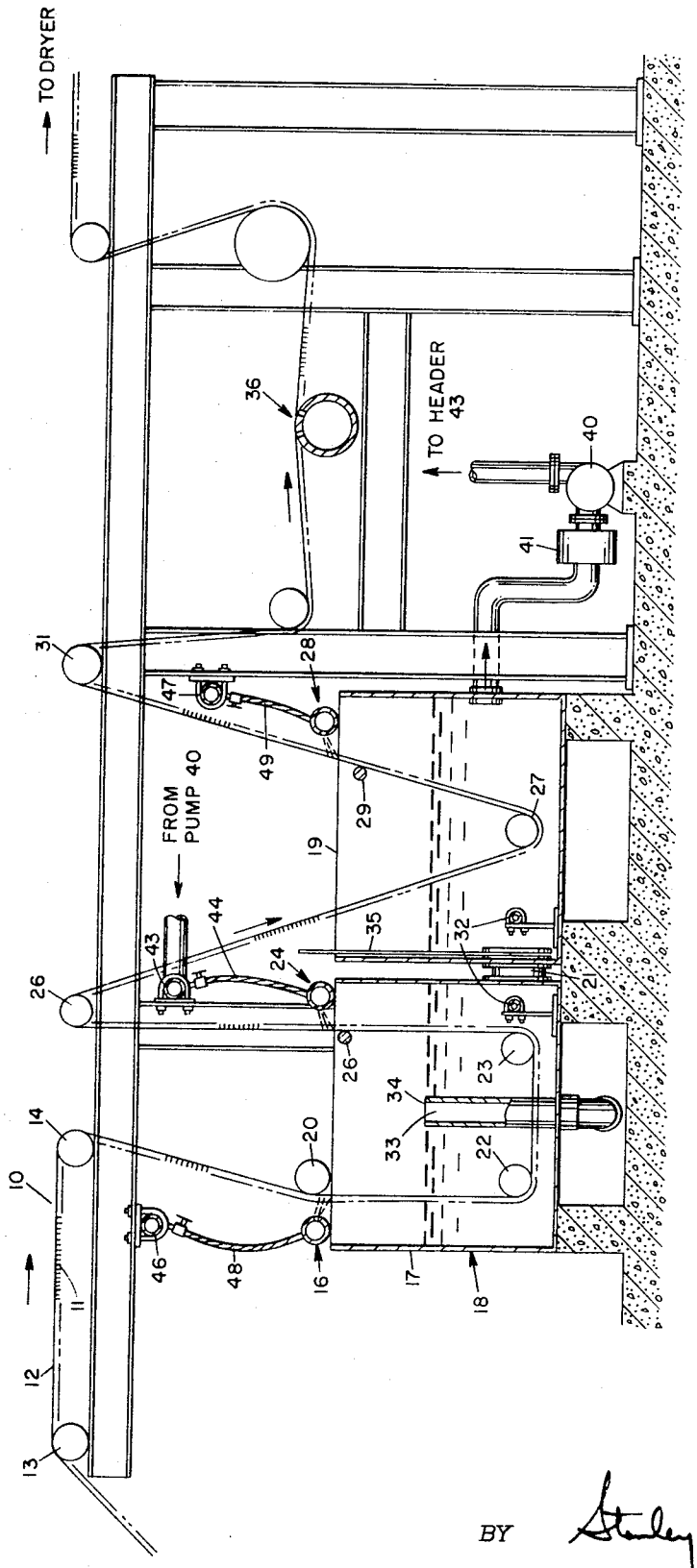
Apparatus for continuously scouring and blooming an advancing pile carpet includes facilities for first wetting the pile side of the carpet with a hot water spray, and then immersing the carpet in a first tank containing hot water. The carpet is then advanced past a high pressure spray positioned above the first tank which directs a high impact spray at the pile to remove the finish on the pile and provide the initial blooming or bulk development of the yarn. The carpet then passes through a second tank containing hot water and past a final spray which rinses away any residual finish and provides the final blooming. Water to supply the high pressure spray is pumped from the second tank. The first and second tanks are interconnected so that water can flow from the first tank into the second tank to supply the pump. Facilities are also provided to remove the finish from the water in the first tank.

8 Claims, 1 Drawing Figure



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RODMAN I. GREGG
INVENTOR

BY Stanley A. Becker

ATTORNEY

APPARATUS FOR SCOURING AND BLOOMING PILE CARPET

BACKGROUND OF THE INVENTION

This invention relates to an improved method and apparatus for continuous carpet scouring and blooming, and particularly to a method and apparatus for continuously removing from the carpet yarn the finish that may be used during the processing and handling of the yarn, and for blooming or opening the yarn.

In the manufacture of pile carpet with synthetic yarns or fibers, the synthetic yarns normally have a finish on them so that the yarns can easily pass through the tufting machines. The finish primarily acts as a lubricant to permit the yarn to go through the needles and guides of the tufting machines. After the tufting operation, however, it is necessary to remove the finish so that the carpet has good resistance to soiling. Any finish remaining on the carpet tends to attract dirt resulting in a carpet which soils easily and is very difficult to clean. Generally, it is considered acceptable if the finish content in the scoured carpet is not greater than 0.7 percent to 0.8 percent. The scouring operations are for the purpose of removing the finish from the yarn, and the blooming operations are for the purpose of opening the carpet tufts giving the carpet more bulk, better appearance, and a better feel or "hand."

Heretofore, in making carpet with undyed yarns, the finish was removed from the carpet during the dyeing operation wherein the carpet was passed through large tanks containing dye. This was not a continuous process, but rather was a batch-type process in which a predetermined length of carpet had its ends sewn or otherwise attached together to form an endless belt which was then rotated in and through the dyeing tank for a particular length of time. The finish on the yarn was loosened and removed as the carpet passed through the dye solution.

With the advent of synthetic yarns which were precolored or pre-dyed, the dyeing operation became unnecessary. However, it was still necessary to scour the carpet to remove the finish therefrom, and it was also desirable in many instances, depending on the particular type of yarn, to bloom the carpet to provide a bulkier, better appearing carpet. An example of a prior art carpet scouring and blooming apparatus is disclosed in U.S. Pat. application Ser. No. 792,990, filed Jan. 22, 1969, now U.S. Pat. No. 3,589,147 and assigned to the same assignee as herein. This apparatus scours and blooms by passing steam through the carpet and using hot water sprays. However, in many applications, the use of steam is not feasible or economical to scour and bloom carpet. Sometimes, for example, there is only a limited supply of steam at a mill and it is uneconomical to try to utilize it for carpet scouring and blooming operations. Moreover, steam scouring and blooming has been found to be ineffective on certain synthetic yarns. Additionally, the use of steam requires very careful control of the application of the steam to the carpet. If there is non-uniform application of the steam, such as, for example, if the carpet were to slow down or even stop as it passed the steam jets, the non-uniform application of steam may result in color changes, streaking, or some other non-uniform appearance characteristics in the carpet.

SUMMARY OF THE INVENTION

The subject method and apparatus for the continuous scouring and blooming of carpets utilizes a plurality of successive hot water sprays to completely scour any finish from a pile carpet and bloom the yarn before drying. The apparatus includes a first low pressure hot water spray which initiates loosening of the finish on the yarn. The carpet then continues into a first tank or section of a wet-out box where it is immersed. Following immersion, the carpet is sprayed with high pressure hot water to remove most of the finish and provide the blooming or bulk development action on the fibers. This opens the carpet tufts giving the carpet more bulk and a better hand or feel. Back-up rollers or bars are provided at the spraying areas to prevent billowing of the carpet as it passes the spray nozzles and provide uniform coverage of the spray. The back-up bars are positioned at a predetermined distance from the spray nozzles to obtain a uniform spray and maximum impact and velocity of the spray for the greatest scouring action. The carpet is then passed downwardly into a second tank or section of the wet-out box where it is immersed again. Following this immersion, a second low pressure water spray of clean hot water washes away any residual or carry over finish. The carpet is then guided to a conventional vacuum extraction station where the greater portion of the remaining water is removed from the carpet. The first and second tanks or sections of the wet-out box are interconnected so that the water from the first tank can flow through a passageway or conduit into the second tank. Since most of the finish falls into the first tank, the water in the second tank remains relatively clean. The suction side of a high pressure pump is connected through a filter to the second tank of the wet-out box to supply water to the high pressure sprays which are positioned above the first tank. By circulating water from the first tank to the second tank to supply the high pressure pump, a large saving is realized in the quantity of water that must be utilized for the scouring and blooming operations.

The subject apparatus and method is advantageously used to continuously scour and bloom carpet. It is economical in view of its use of hot water instead of steam, and also because of the efficient use of water resulting from the use of the two tank wet-out box. It effectively reduces the finish content in the scoured goods well below the 0.7 percent to 0.8 percent level generally considered acceptable for good resistance to soiling, and also provides improved blooming and bulk development of the yarn. Additionally, the subject apparatus and method is effective to scour and bloom synthetic yarns of many varieties.

Other advantages of the present invention will be apparent from the following detailed description when considered in conjunction with the following detailed drawing, which drawing forms a part of this specification. It is to be noted, however, that the drawing illustrates only a typical embodiment of the invention and is therefore not to be considered limiting of its scope, for the invention may admit to other equally effective embodiments.

BRIEF DESCRIPTION OF THE DRAWING

The drawing shows side partially sectioned view of the apparatus embodying the principles of this invention illustrating the carpet passing through the various stations and the operations performed thereon.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to the drawing, there is shown a carpet scouring and blooming apparatus in accordance with the principles of this invention. A carpet generally designated as **10**, has a pile surface **11** which is formed by conventional tufting techniques on a backing **12**. The carpet **10** is continuously advanced to the subject scouring and blooming apparatus from a folded condition on buggies or from roll stock which is unrolled through an accumulator (not shown) or from some other storage facility. The maximum rate at which the carpet may be processed ordinarily depends upon the capacity of the dryer or oven. The carpet passes over a plurality of rollers **13** and **14** and is directed downwardly past a first low pressure hot water spray generally indicated as **16**. Here, hot water is sprayed uniformly across the pile or face of the advancing carpet so that the finish which is on the yarn is loosened and washed into a first tank **17** of a wet-out box generally designated as **18**. It has been found desirable for maximum impact and penetration to have the spray impinge downwardly on the moving carpet at an angle of, for example, 15° from a line perpendicular to the path of the carpet. The low pressure spray **16** is typically at 50 p.s.i.g. or more and 160°–180° F. The spray nozzles (not shown) utilized for the low pressure spray **16** may be, for example, V-jet fine spray nozzles. A back-up bar **20** supports the carpet a uniform distance from the low pressure spray nozzles to prevent billowing and assure uniform spray coverage.

A second tank **19** of the wet-out box is interconnected by one or more pipes **21** to the first tank **17**, the purpose of which is described more fully hereinafter. While the wet-out box **18** is described as having two separate tanks, it may also be one large tank divided into two sections. The carpet **10** passes by the first low pressure spray **16** and is immersed in the hot water contained in the first tank **17** of the wet-out box. The water in the first tank **17** of the wet-out box typically ranges in temperature from 160° F. to 180° F. The immersion in the hot water loosens more of the finish on the carpet yarns. To obtain a maximum immersion time in tank **17**, the carpet passes around a plurality of rollers **22** and **23**. A maximum immersion time is desirable in order to loosen the finish as much as possible and facilitate its removal by subsequent sprays.

As the carpet exits from the first tank **17** of the wet-out box, the pile **11** is subjected to a high pressure, high impact hot water spray **24**. This high pressure spray which is typically at about 100–135 p.s.i.g. and 160°–180° F. serves both to loosen and remove most of the remaining finish on the yarn and to provide the first blooming or bulk development action of the yarn. Typically, this spray may also be directed against the carpet downwardly at some predetermined angle from a line perpendicular to the carpet path, such as 15° or more. Directing this spray at an angle avoids mashing the carpet against the backing and provides a tangential brushing or fluffing effect for improved blooming. A back-up bar **26** which extends transversely across the width of the carpet **10** is positioned a predetermined distance away from the high pressure spray nozzles to support the carpet and prevent billowing and excess motion of the carpet as it passes the high pressure spray, and to insure maximum and uniform impact of the spray on the carpet for the greatest scouring action. It is to be noted that the finish washed off the pile by the high pressure spray **24** also falls into the first tank **17** of the wet-out box, and eventually overflows through standpipe or drain **33** to a sewer.

The carpet **10** advances from the high pressure hot water spray **24** over roller **26** and into the second tank **19** of the wet-out box, also desirably maintained at a temperature of 160° F. to 180° F. The second immersion of the carpet in the water of the second tank **19** of the wet-out box carries away any residual finish which may have been loosened by the previous sprays and has not yet fallen off. The carpet **10** passes through the second tank **19** around rollers **27** and from there past another low pressure hot water spray **28** which washes away any residual finish remaining on the yarns and also provides the final blooming and bulk development of the yarn. Another back-up bar **29** is also provided transversely across the width of the carpet to keep the carpet a uniform distance from the low pressure spray nozzles and assure uniformity of spray coverage to prevent streaking. The carpet then passes over roller **31** and advances to a conventional vacuum water extraction station **36** wherein excess water is removed from the carpet. From there, the carpet **10** advances to a dryer or oven.

In order to save water and to provide the most efficient and economical operation, the wet-out box **18** consists of two tanks or sections **17** and **19** which are interconnected, such as by one or more pipes **21**. A drain pipe **33** having its inlet end **34** positioned at a predetermined level in the tank **17** provides a substantially constant level in tank **17**. For the high pressure system, the suction side of a high pressure pump **40** is connected to the tank **19**. The pump **40**, which may have a large capacity such as 100 gallons per minute, supplies the high pressure sprays **24**. It is important that a filter **41** be placed upstream of the pump **40** to protect the pump as well as to remove any lint or pieces of backing material that may be in the water thereby preventing clogging of the spray nozzles. For the low pressure system, the low pressure sprays **16** and **28** are supplied by a water source which is not shown. Thus, the only clean water introduced into the process is through the low pressure sprays. The high pressure spray utilizes water already in the tanks in order to conserve the amount of water used. For controlling the flow of water from tank **17** into tank **19**, an adjustable slide gate **35** is utilized to permit adjusting the openings interconnecting tanks **17** and **19**. Normally the slide gate **35** will be positioned to provide an adequate supply to the pump **40**, and to insure a steady flow of effluent into drainpipe **33**.

It is to be noted that the finish which comes off of the yarn in tank **17** floats on top of the water so that the removal of water through the drain pipe **33** removes most of the finish, thereby keeping the concentration of finish in tank **17** relatively low at all times. During normal operation, a large percentage of the finish removed from the carpet will concentrate on the water surface in the first tank **17** and it is essential that this be re-

moved as efficiently as possible. The water in the second tank **19** will contain a great deal less of the removed finish since the high pressure spray **24** flushes the bulk of it into the first tank **17.**

Both tanks **17** and **19** of the wet-out box **18** are equipped with steam sparge pipes or some other heating facilities, such as electrical immersion heaters, to maintain the desired temperature of the water. For example, steam heating pipes **32** can be placed in each of the tanks **17** and **19** of the wet-out box to heat the water therein. To provide uniform and equal distribution of pressurized water into each of the many spray nozzles (not shown), the hot water is pumped into headers and from there through hoses into the sprays. For the high pressure system, water is pumped from pump **40** into a header, such as **43,** and then is delivered by flexible hoses **44** into the high pressure spray **24.** Likewise, for the low pressure system, water is pumped from a separate water source into headers **46** and **47** and is delivered through flexible hoses **48** and **49** to low pressure sprays **16** and **28** respectively.

While the subject apparatus and method has been described as being primarily for scouring and blooming pile carpet, it also is useful for aligning and untangling the relatively long pile in shag carpets prior to drying. Moreover, it is also useful for cleaning and scouring fabrics, such as upholstery fabrics. While a particular combination of low and high pressure sprays has been described herein, the sequence of the sprays may be changed and other spray combinations may be used depending on conditions, such as the particular yarn of which the carpet is made. Hence, it is to be understood that the above described embodiment is merely illustrative of the applications and principles of the invention, and that numerous other arrangements and modifications may be made without departing from the spirit and scope of this invention.

What I claim and desire to protect by Letters Patent is:

1. Apparatus for scouring and blooming a pile carpet comprising:

a first and second tank, each at least partially filled with water, said first and second tanks being interconnected to provide water flow therebetween;

means for advancing the carpet through said first tank and then through said second tank;

first spray means positioned above said first tank for spraying the pile side of said advancing carpet with hot water prior to entering the water in said first tank;

second spray means positioned above said first tank for spraying said pile side of said carpet with hot water under high pressure as it exits from the water in said first tank;

third spray means for spraying said pile side of said carpet as it exits from said second tank; and

means for pumping water from said second tank to supply said second spray means.

2. Apparatus for scouring and blooming a pile carpet as set forth in claim **1** including means for controlling the flow of water from said first tank to said second tank to provide an adequate supply for said pump.

3. Apparatus for scouring and blooming a pile carpet as set forth in claim **1** wherein the pressure of said second high pressure spray means is at least 100 p.s.i.g.

4. Apparatus for scouring and blooming a pile carpet as set forth in claim **3** wherein said high pressure spray is directed at a predetermined angle to said carpet in a direction opposite to the path of said advancing carpet.

5. Apparatus for scouring and blooming a pile carpet as set forth in claim **4** wherein said predetermined angle is at least 15° as measured from a line perpendicular to said path of said carpet.

6. Apparatus for scouring and blooming a pile carpet as set forth in claim **5** including means positioned substantially opposite to said second high pressure spray means for supporting said carpet a predetermined distance from said second spray means to provide uniform impact of the spray transversely across said carpet.

7. Apparatus for scouring and blooming a pile carpet comprising:

a first and a second tank each adapted to be at least partially filled with water, said tanks being interconnected to provide water flow therebetween;

means for continuously advancing a carpet first into and out of said first tank, and then into and out of said second tank;

first spray means positioned above said first tank for uniformly spraying the pile side of said carpet prior to entering the water in said first tank;

second spray means positioned above said first tank for uniformly directing a high pressure spray at the pile side of said carpet after leaving the water in said first tank to remove the finish on said pile and initiate blooming thereof;

means for maintaining a substantially constant level of water in said first tank and draining excess water and removed finish therefrom;

third spray means positioned above said second tank for uniformly spraying the pile side of said carpet after leaving the water in said second tank;

means for heating the water in said first and second tanks;

means for pumping water from said second tank to supply said second spray means; and

means for controlling the flow of water from said first tank to said second tank to provide an adequate supply for said pumping means.

8. Apparatus for scouring and blooming a pile carpet as set forth in claim **7** wherein said second spray has a pressure of at least 100 p.s.i.g. and is directed at an angle against the advancing carpet.

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