July 11, 1944. H. O. KAUFFMANN ET AL 2,353,615

METHOD OF HEATING GOODS

Filed March 27, 1941

Fig. 1.

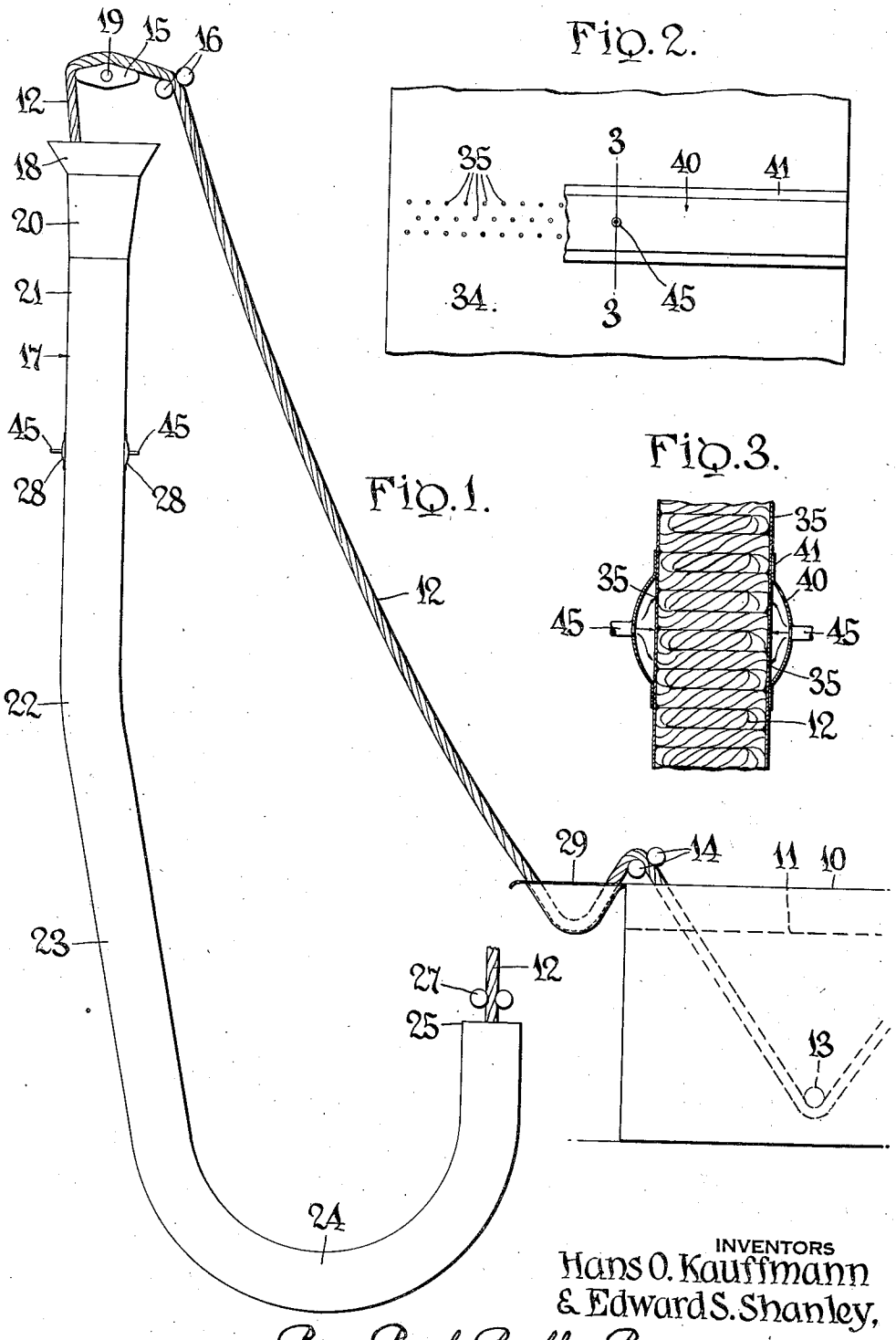


Fig. 2.

Fig. 3.

INVENTORS
Hans O. Kauffmann
& Edward S. Shanley,

Beau, Brooks, Buckley & Beau. ATTORNEYS

Patented July 11, 1944 2,353,615

UNITED STATES PATENT OFFICE

2,353,615

METHOD OF HEATING GOODS

Hans O. Kauffmann, Eggertsville, and Edward S. Shanley, Buffalo, N. Y., assignors to Buffalo Electro-Chemical Company, Inc., Buffalo, N. Y.

Application March 27, 1941, Serial No. 385,576

4 Claims. (Cl. 8—152)

This invention relates to a method of heating textile fibers and goods made therefrom while the goods are padded or dampened with a treating solution.

In a great many steps of textile processing it is necessary to heat the goods. It is often necessary to obtain a high temperature in order to perform operations such as dyeing, bleaching, finishing, scouring, boiling, shrinking, etc. These operations may be performed on woven or knit goods, on yarn or raw stock and in fact in any suitable stage of manufacturing the textile article from the raw to the finished goods. It is a great advantage to carry out such operations in a continuous manner for which purpose the goods must be attached together to form a continuous strand. This may be accomplished by sewing piece or knit goods end to end, by linking skeins of yarn or by transporting raw stock on a suitable conveyor. This is called the rope form. Goods in this roped form may be handled very conveniently and may be moved from place to place at high speed, it being common practice to transport goods at speeds of 100 to 300 yards per minute, depending upon the type and construction of the goods.

The goods in roped form have been immersed in or dampened with particular treating solutions adapted to perform certain processing steps and change the goods in a desired fashion. For heating of goods continuously in rope form various methods and devices are in use or have been proposed.

One method of imparting heat to dampened roped goods is to wet out the goods with the treating solution, remove the excess of the treating solution until the goods are damp and then run the goods in the extended rope form through a heated atmosphere consisting of steam or hot air or a mixture of both. Thereafter the goods are piled into a suitable container to form a bulk in which form they remain until the desired result is obtained. Such a method requires cumbersome apparatus and costly equipment because the necessary machinery to move the goods through the atmosphere and pile them in the container must be completely enclosed to maintain the high temperature in the goods. This machinery is also continuously subjected to the action of the steam or the other means of heating with obvious disadvantages.

Another method is to immerse goods in the heated treating solution for a period of time or dampen the same with the pre-heated solution and then pile the goods in bulk form in a suitable container. Such a method has similar disadvantages. Moreover, in many cases the solutions with which the goods are dampened do not maintain their original characteristics when subjected to high temperatures.

In these prior procedures the apparatus employed for handling and moving the goods has been enclosed in the heating chamber. The mechanical difficulties, and the expensive devices that had to be employed, have militated against the introduction of the continuous treating of textiles in rope form at elevated temperatures.

Where goods in roped form are dampened with the treating solution and processed in the unheated solution, it has been common practice to feed and pile the unheated goods in a so-called J-chute. In hot processing, the goods were heated prior to their entrance into the J-chute or the J-chute was enclosed within a heating or steam chamber. In either procedure the devices for carrying out such processing are subjected to the above mentioned disadvantages.

It is an object of the invention to provide a procedure for continuously heating dampened roped goods in bulk form.

A further object of the invention is to provide a method of heating all types of goods in bulk form at low liquor ratio.

The present invention provides a method of heating goods continuously in rope form and at low liquor ratio producing goods of even characteristics at low cost and with simplified apparatus.

The following description illustrates the method of the invention. The roped goods dampened with the treating solution, that is to say, containing sufficient of the treating solution to perform the expected function thereof but having insufficient treating solution to drip from the goods, are continuously passed into a heating chamber, of a type more fully described hereinafter, whereby the goods are packed in said chamber. In general, the goods will contain about 50–200% of treating solution, based on the dry weight of the goods, although in most instances 90% to 130% of solution will be sufficient.

The goods are piled and packed in the heating chamber by any conventional type of piling or plaiting device, which device is placed above the feed end of the heating chamber and out of contact with the heating medium. The dampened goods in rope form fall into the feed end of the heating chamber and become packed therein, and due to the special construction of this chamber move from the feed end towards the dis-

charge end, but at a rate considerably below the linear speed with which the rope is fed into the device. Due to the fact that the goods are damp they pack in and fill the heating chamber completely. In general, the movement of the packed goods in the heating chamber will be less than about 1/20 of the rate of movement of the roped goods entering the feed end of the chamber.

The goods in the chamber are heated by directing steam or other heating medium into the so packed heating chamber at a point sufficiently below the feed end, so that there is relatively little, if any, loss of heating medium through the open feed end while the desired temperature is maintained throughout the goods packed into the chamber. Since the goods are fed continuously, it is possible to regulate the flow of heating medium in such a way as to obtain this result. The heating medium is directed upon the main bulk of the goods packed within the heating chamber as this bulk is moved at a relatively low rate of speed, as contrasted with the rate of feeding. Since the goods are continuously withdrawn from the chamber at the discharge end at substantially the same rate as they are fed into the chamber at the feed end, the packed goods move slowly toward and past the point at which the heating medium is introduced and directed upon the bulk of the goods. It has been found that the goods packed into the chamber are heated up to the desired temperature quickly and uniformly. Thus the procedure produces evenness of heating and the goods are maintained in the heated condition throughout the period of treatment, and are discharged from the chamber while still hot, the temperature in all parts of the chamber being substantially the same even though the heating medium be introduced at only a restricted point or area of the heating chamber.

The drawing appended hereto illustrates a device suitable for carrying out the invention. Like reference characters designate like parts and

Fig. 1 is a side elevation of a species of the improved apparatus;

Fig. 2 is an enlarged fragmentary portion of the device in front elevation showing the steam connection; and

Fig. 3 is a section on line 3—3 of Fig. 2.

Referring more particularly to the drawing, vat 10 contains a treating solution 11 into which goods 12 are fed in roped form. The goods pass under guide bar 13 in order positively to submerge the goods in the solution and evenly and uniformly to impregnate and saturate the goods with the treating solution. The goods are drawn from the bath by means of a pair of squeezer rolls 14 which are set to a pressure to express excess of the treating solution from the goods and to leave 50% to 200% of the treating solution in the goods, based upon the dry weight of the goods. The goods leaving rolls 14 are in the damp condition.

Goods leaving squeezer rolls 14 pass to a rest 29 and then to plaiting device 15 of conventional type, and to this end rolls 16 are provided to pull the goods to this point. Piler or plaiter 15 is positioned above a combined J-chute and heating chamber 17, to be more fully described hereinafter, in such fashion that roped goods 12 pass in plaited form into the flared feed end 18 of chute 17 from side to side as the plaiter 15 revolves about the axis 19 and reciprocates along this axis.

Below the flared feed end 18, the chut is tapered at 20 to facilitate tight packing of the goods. A substantially vertical leg of the chute is provided below the tapered upper end 20 at 21, the weight of the packed goods inducing movement downwardly within the chute. This vertical leg 21 is joined at elbow 22 with an angularly positioned leg 23, the latter being connected with curved portion 24 terminating in the discharge end 25 of the completed chute. The goods are removed from the chute by rolls 27 and passed to additional treating apparatus, for instance, a washer, not shown.

Chute 17 may be fabricated of or lined with any conventional material not adversely affected by the treating solution at the temperature of treatment, as, for instance, wood or metal. The outside of the chute if fabricated from metal may be advantageously covered with insulation.

Chute 17 is provided adjacent its feed end with the steam connection or jacket 28 for admitting and directing heating medium positively to the interior of the chute to heat the goods. In this fashion unheated goods being fed into the chute and at a point above the steam connection are heated and goods below the connection are maintained at elevated temperature.

Referring to Fig. 2 and Fig. 3, steam jacket 28 is attached to a side 34 of chute 17, although the jacket may surround the chute. In the form illustrated, the jacket is attached to two opposite sides of the chute. Thus, in Fig. 2 a side 34 of chute 17 is shown having a band of spaced openings 35 through which the gaseous heating medium enters the interior of the chute to heat the contents thereof. In order to form a fluid tight chest, cap 40 is spaced from side wall 34 but attached thereto in any convenient fashion by flanges 41.

Heating medium, such as steam, is admitted to the steam chest constituting the space between cap 40 and side wall 34 through nipple 45 and is introduced to the interior of the chute through the band of perforations 35. The perforations constitute only a small fraction of the area of the chute and we have found that excellent and uniform heating is obtained with the perforated area of less than 3% of the total area of the chute.

The following are illustrations of the operation of the invention.

A small J-chute was constructed with cross sectional dimension of 1.5 feet by 0.5 feet and a height of 7 feet from the low point of the J-chute to the open feed end. Two steam connections were attached to the 0.5 foot walls 2.5 feet below the open feed end. Three-yard terry cloth was saturated with 100% treating solution and fed in rope form to the J-chute at a rate of three yards per minute. 225 yards were required to fill the J-chute. Steam was admitted and a temperature of 212° F. was obtained and maintained in all parts of the goods, although steam was introduced only at a point adjacent the feed end.

Damp goods were continuously fed to the filled J-chute at a rate of three yards per minute and continuously withdrawn at the same rate. The treating time was 75 minutes at this rate of feed, which gave a continuous production of three yards per minute.

For larger production a J-chute having cross-sectional dimensions of 6 feet by 1.5 feet and a total height of thirty feet allows for production of 125 yards per minute or 180,000 yards per 24 hours with a treating time of 75 minutes. By increas-

ing the rate of speed the treating time may be decreased or vice versa.

What is claimed is:

1. The method of heating textile goods in rope form which comprises piling the unheated rope of goods dampened with about 50% to 200% of treating solution into one end of a heating chamber having a feed end and a discharge end both open to the atmosphere, completely to fill the same and pack therein compactly, admitting steam freely to the chamber at a point sufficiently below the open feed end to avoid loss of steam therethrough while the desired temperature is maintained throughout the goods and subjecting the so packed goods to the direct action of such steam while continually withdrawing the so heated goods from the other end of the chamber and continually adding dampened unheated goods thereto to be heated, whereby the goods move through the chamber by gravity and the chamber is substantially filled at all times with goods undergoing treatment.

2. The method of heating textile goods in rope form which comprises feeding the unheated rope of goods dampened with 50% to 200% of treating solution at a regulated linear speed into one end of a heating chamber having a feed end and a discharge end both open to the atmosphere, completely to fill the same and pack therein compactly and removing the goods from the other end at substantially the same speed whereby the packed goods pass by gravity through the chamber at a linear speed of less than about 1/20 the linear speed of the goods fed to the chamber, positively feeding steam into the chamber at a point sufficiently below the open feed end to avoid loss of steam therethrough while the desired temperature is maintained throughout the goods, and subjecting the packed goods to the direct action of such steam during their passage through the chamber whereby the bulk of goods is heated to elevated treating temperatures as it moves gradually through the chamber.

3. The method of heating textile goods in rope form which comprises feeding an unheated rope of goods dampened with about 50 to 200% of treating solution into one end of a heating chamber having a feed end and a discharge end, the former being open to the atmosphere, completely to fill the same and pack therein compactly with a bulk of goods, positively directing heating steam into the chamber and into the bulk of goods at a point sufficiently below the open feed end of the chamber to avoid loss of steam through such open feed end while the desired temperature is maintained throughout the goods and continuously withdrawing heated goods from the chamber through the discharge end at substantially the same rate as unheated goods are fed to the chamber whereby the bulk of goods moves through the chamber by gravity at a rate of speed considerably less than the rate of feed.

4. The method of heating textile goods in rope form which comprises feeding an unheated rope of goods dampened with about 50 to 200% of treating solution into one end of a heating chamber having a feed end and a discharge end, the former being open to the atmosphere, completely to fill the same and pack therein compactly with a bulk of goods, positively directing heating steam into the chamber and into the bulk of goods at a point about one-third of the length of the chamber from the feed end thereof to avoid loss of steam through such open feed end while the desired temperature is maintained throughout the goods and continuously withdrawing heated goods from the chamber through the discharge end at substantially the same rate as unheated goods are fed to the chamber whereby the bulk of goods moves through the chamber by gravity at a rate of speed considerably less than the rate of feed.

HANS O. KAUFFMANN.
EDWARD S. SHANLEY.