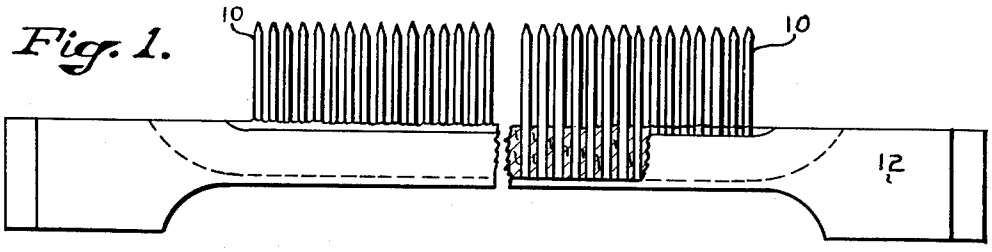
July 3, 1962 G. J. VERHULST 3,042,572

METHOD OF ASSEMBLING AND CEMENTING PINS IN THE GROOVE OF A FALLER BAR

Filed May 28, 1958

Fig. 1.



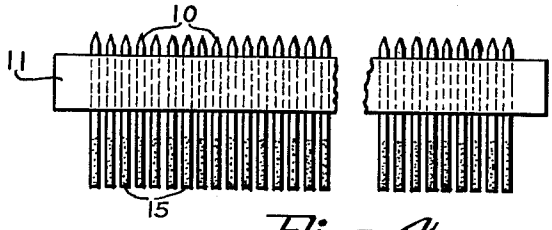


Fig. 4.

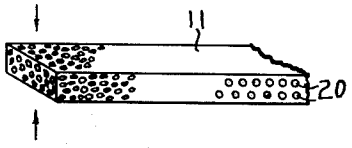


Fig. 2.

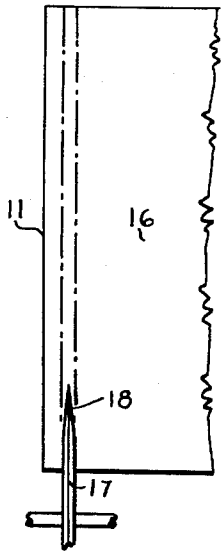


Fig. 3.

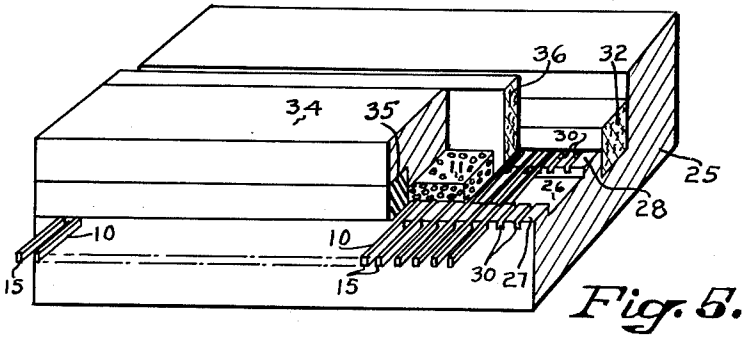


Fig. 5.

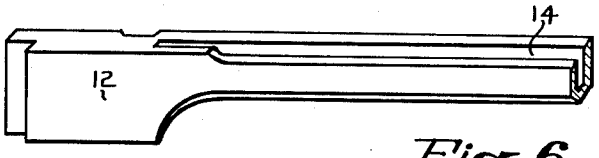


Fig. 6.



Fig. 7.

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METHOD OF ASSEMBLING AND CEMENTING PINS IN THE GROOVE OF A FALLER BAR

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3 Claims. (Cl. 156—250)

This invention relates to a faller bar used for combing various textile materials, and particularly to a method of making the same.

A standard faller bar construction comprises a narrow steel plate having a longitudinal slot in which is cemented a set of combing pins, also termed needles, held in alignment between two adhesive strips which make an imperfect contact therewith. This bar is used for combing wool, cotton, silk, worsted and various synthetic textiles and arranging the textile fibers into substantial parallelism for subsequent spinning into a yarn. A large number of the faller bars are customarily mounted in a combing machine, and they are so operated that each bar passes through a rapid cycle, such as 1500 cycles per minute, first in a combing operation and then a return stroke, and at one stage in the cycle the bar is dropped rather violently and at a high speed. Hence, in addition to the normal wear and tear of a combing operation, the solder or other cement which holds pins in the bar is subjected to severe vibration and other forces tending to disintegrate the cement and dislodge the pins from their cemented positions. It is imperative that the pins be not only spaced accurately but cemented rigidly in place so that they cannot be pulled out of position. It is highly desirable that, after the pins have become badly worn, they may be readily replaced by a new set of pins. Also, it is important that the cement or solder used to hold the pins in place does not creep up into the operative spaces between the pins and interfere with the combing which takes place largely at the base of the pins.

The primary object of my invention is to provide a method of making a faller bar which permits easy and accurate assembly of the pins either initially or for replacement in repairing the bar.

Another object is to provide a faller bar construction in which the pins are directly cemented in a correct spacing and alignment in a slot in the bar by a cement which makes a direct contact with both the pins and the metal of the bar.

Another object is to provide a method of assembly in which the pins are so treated initially that the cement adheres firmly to only that portion of the pin which lies within the bar slot and will not creep outwardly along the pins or bar.

A further object is to provide an intermediate article of utility which serves temporarily for assembly of the pins in the bar in a correct alignment and which may be subsequently removed after the pins have been properly cemented in place. Other objects will be apparent in the following disclosure.

In accordance with my invention, I propose to mount a set of combing pins in proper alignment in a removable assembly strip of a penetratable, fairly stiff substance, and while the pins are held by the strip in parallelism and with their ends in alignment, assemble the butt ends of the pins in the groove of a faller bar and cement them rigidly in place, and finally remove the strip. I may also roughen the butt ends of the pins, as by sandblasting, for better adhesion of the cement, and the latter is so selected that it adheres tenaciously and directly to the metal of both the bar and the pins.

Referring to the drawings which illustrate somewhat

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diagrammatically the method steps involved in assembling the pins and cementing them in a faller bar, as well as to the products of the various stages:

FIG. 1 is an elevation, partly broken away, of the completed faller bar;

FIG. 2 is a fragmentary isometric view of the assembly strip;

FIG. 3 is a diagrammatic view showing the compression sawing of the strip;

FIG. 4 is a plan view showing the pins assembled in the strip;

FIG. 5 is an is an isometric somewhat diagrammatic view, partly broken away, showing the method of assembling the pins in the strip;

FIG. 6 is a fragmentary isometric view of the faller bar before mounting the pins therein; and

FIG. 7 is a view of a pin taken at right angles to the view in FIG. 4.

The various stages of manufacture comprise, after the sharpened steel pins and a grooved steel faller bar have been provided, assembling a single row of pins 10, as shown in FIG. 4, in a parallel and aligned relationship in an assembly strip 11 of fairly stiff material which is readily penetrated by the pins and is capable of holding them in position until they have been cemented in the faller bar 12, then mounting the pins in the faller bar groove 14, cementing them in place and finally removing the strip.

The temporary pin holder strip 11 (FIG. 2) may be made of various easily penetrated substances, such as a porous synthetic resin body, and particularly polystyrene, which has such dimensions and characteristics that it is capable of holding the set of pins 10 firmly in position and with the inner or butt ends 15 of the pins projecting by a distance sufficient to permit cementing these ends in the faller bar. Various other materials may be substituted for the polystyrene strip, such as cork or a stiff paper having a loop through which the pins have been inserted. The strip material should be capable of adhering sufficiently to the pins by friction so as to hold them in parallelism with their ends in longitudinal alignment for the purpose of embedding the butt ends of the pins in the cementing groove of the bar.

The preferred strip material is a porous polystyrene made by the Dow Chemical Company and known as "Styrofoam" #22. This has a sponge-like structure of coarse porosity capable of ready penetration by the rounded or sharpened ends of the steel pins. The #22 material is a highly porous yet fairly stiff body which has such a structure that the pins may be readily pushed manually through a strip of ½" or more thickness, and yet there is enough substance between the pores to hold the pins firmly positioned in the required alignment.

I have also found that the Styrofoam plastic strip may have its side faces, which are parallel with the pins, compressed or sealed slightly to form stronger side portions. This is preferably accomplished by cutting the strip from a large block 16 of the polystyrene (FIG. 3) by means of the wedging action of a power driven rotary tapered circular knife 17, or a set of wedging saw teeth in a band saw, so that as the knife penetrates the block the increasing thickness of the blade provided by the taper 18 will compress the plastic material laterally; and, because of the frictional heat generated, the pores of the side faces are not only compressed transversely but are somewhat closed. The teeth of a band saw may be so shaped, by grinding, that in addition to a required set they are provided with outer surfaces which are so inclined as to provide the lateral compressive action during the sawing stage. This compression is preferably only in the direction of the arrows in FIG. 2, or perpendicular to the plane

of the drawing in FIG. 4, and the pins are to be inserted through the narrow front face of FIG. 2 and parallel with the compressed sides. A suitable strip for one set of pins may measure 5/16 x 3/8 x 6 inches. It preferably has such a thickness that it may be used twice, the first time with the aligne dpins near one side face and the second time after a reversal of the strip, near the other side face, as indicated by the two rows of holes 20 as the right-hand side of FIG. 2.

The pins 10 may be assembled in the Styrofoam strip 11 by various suitable procedures and apparatus. I have shown in FIG. 5 diagrammatically how this may be best accomplished. A metal block or base 25 having parallel top and bottom faces serves as a base or support on which the pins are assembled. This support is provided with a central groove 26 which is shaped and proportioned to hold the Styrofoam strip 11 fitted therein but projecting upwardly for receiving the pins. The two raised portions 27 and 28 on the opposite sides of the groove 26 are each provided with parallel transverse channels or pin locating slots or grooves 30 which serve as supports for aligning the pins. The grooves 30 are shaped to provide for a longitudinal sliding fit of each pin. The pins are preferably shaped as shown in FIGS. 4 and 7. They are rectangular in cross-section at their butt ends 15, as indicated in FIG. 5, and the parallel grooves 30 are so shaped that the pins may be assembled with their greater width vertical, so that the maximum spacing and lateral strength will be provided for a given size and pin spacing. Ordinarily these pins are so spaced in a non-contiguous arrangement as to provide 9, 12, 15, 18, 22 or 29 pins per inch, and the cross-section of the pins will be made in proportion to their spacing so as to give the necessary room for the combing operation. Usually the length of the pin section of the faller bar is 5, 6 or 8 inches. The pins are usually about 1.25 inches in length and are made of steel by suitable operations employed in the manufacture of needles and like articles.

As shown in FIG. 5, the pins 10 are mounted with their sides in parallelism except at their pointed ends, and the spacing and sizes of the grooves 30 are such as to give the required number of pins of chosen dimensions their predetermined spacing. As indicated in FIG. 7, the pin may taper throughout a third or more of its length from the roughened base portion towards the point. In order to provide the required alignment of the ends of the pins, I prefer to mount a bar 32 of suitable substance that will provide an inner flat vertical face which the pin points may engage. A press bar 34 which is to be held in place on top of the strip 11, as by clamps, is provided with a strip 35 of suitable material, such as silicone rubber, so arranged that when the pins are inserted into place in the grooves 30, the rubber urges them downwardly into a firm contact with their grooves so that they will enter the side face of the Styrofoam strip 11 in a line. As indicated in the figure, the press bar 34 engages the top of the Styrofoam strip and holds it firmly in the slot 26 in the base. Also, if desired, a fiber strip 36 may be secured at the rear of the press bar 34, and it is intended to bear down on the pointed ends of the pin and insure that they are positioned correctly in the grooves 30 of the portion 28 of the support 25. Thus, when these various parts are assembled, as shown in FIG. 5, the pins may be inserted manually or otherwise into the grooves 30 and forced through the Styrofoam strip to a point where their inner pointed ends engage the bar 32 and lie substantially in the plane of the contact face of the bar. Hence, these pins of equal length have their pointed ends as well as their rear faces in alignment in two parallel planes. The depth of the groove 26 is such that the Styrofoam strip 11 is so located that the pins enter the Styrofoam strip near the bottom thereof and thus form the lower set of holes 20 shown in FIG. 2. The strip 11 may be re-used a second time by merely turning it over so that the previously made holes will be at the top of the strip and the new ones

at the bottom. The strip is preferably discarded after the second use. It will also be noted that the length of the grooves 30 in the part 28 of the base are comparatively short so that only a small part of the total length of the pointed part of each pin projects beyond the Styrofoam strip. This leaves the outer ends 15 of the pin projecting well outside of the base structure 25 and the press bar 34.

While the pins are mounted in the structure of FIG. 5, their butt ends may be subjected to a sandblast or other operation intended to provide a roughened pin surface. The sides of the apparatus may be suitably protected if deemed necessary to prevent abrasive wear. The abrasive grains used in the sandblast operation are of such size and the duration of the blasting operation is limited so that the outer surfaces of the ends 15 of the pins are adequately roughened to provide a more extensive surface area, so that the cement will adhere firmly thereto and prevent each pin from being withdrawn lengthwise under the high forces frequently met during the combing operation. The projecting and abraded surface portions of the pins (FIG. 5) are substantially equal in length to the depth of the groove 14 in the faller bar 12. The remainder of the pin has a smooth surface, so that liquid adhesive disposed in the faller bar groove 14 will adhere only to the roughened surfaces and will not climb up the smooth sides of the pins to any material extent or above the top of the faller bar. This insures that no cement will creep into the spaces between the pins and interfere with the operation of the device for combing the textile material. After the pins have been thus sandblasted at their butt or rear ends, the strip 11 with its assembled pins is removed and the pins are now ready to be cemented in the bar.

The preferred practice for cementing the pins in place comprises standing the faller bar on edge with its trough or groove 14 vertical as shown in FIG. 6, and after cleaning the groove 14 and pins with carbon tetrachloride, pouring into the groove 14 a measured amount of hard-enable liquid resin adhesive of low shrinkability made of a mixture of desired proportions of an epoxy resin and a catalyzer, such as 4 to 1 parts. Thereafter, the butt ends of the pins are inserted into the groove, while the pins are still held in their holder strip 11, and if necessary, a further amount of cement is added to the groove to fill the same. The roughened surfaces of the pins reach only to the top of the cement body, so that the cement is prevented from creeping upwardly along the smooth pin bodies or between the same.

Various types of synthetic resin cement may be employed for the purpose, provided the cement has the capacity of bonding strongly to metal, so that no intermediate strip or other material is present in the bar groove and only the extremely hard cement body is present and there is no non-rigid material in the groove in engagement with the pins which might permit the pins to be pulled out lengthwise as has been the case heretofore. There are many cementitious materials capable of bonding to metal, such as the epoxy resins which are long chain polymers formed as condensation products of epichlorohydrin and polyhydroxyl compounds. These are cured or converted to a thermoset condition by cross-linking and coupling with amines or acid anhydrides as catalyzers. The resin and the catalyzer are held separate until just before the time of use. The amine cured resins harden quickly within thirty minutes or so or they may be cured or hardened more quickly by the application of heat at comparatively low temperatures, such as 200° F. or lower. The anhydride cure gives a longer time for use before hardening, but requires a higher temperature, such as 300° to 500° F. I may use the epoxy-amine adhesive which is furnished as two separate liquid ingredients and are to be combined only just before use. The epoxy resin and the amine catalyzer harden after mixing in about twenty to thirty minutes, and the conversion to a thermoset body may be com-

pleted by heating the bar in an oven at a temperature of about 140° to 160° F. held for one to two hours.

Because of the extreme rapidity of hardening of the cement, only a small number of faller bars may be built with one mixture of the cement ingredients. The operation is best accomplished by pouring, by means of a spatula, a measured amount of the liquid adhesive mixture of the epoxy resin and an amine catalyzer into the bar groove to a given height well below the top of the groove 14, after which the pins, while still mounted in their holder strip, have their butt ends inserted into the cement in the groove. If needed, further liquid adhesive is poured into the groove to a desired height. Then, after a comparatively short time, such as twenty to thirty minutes, and before the curing stage, the strips 11 may be removed from the set of pins. Any cement which has escaped onto the side of the bar or onto the smooth parts of the pins may be removed by means of a solvent of methyl ethyl ketone or other suitable reagent. The curing of the cement to form a thermoset body is effected by transferring a set of the faller bars, after removal of the strips 11, to an oven suitably heated to about 140° F to 160° F. and there held for ninety to one hundred twenty minutes, more or less. The pins may be readily removed from the faller bar by subjecting the latter to a high temperature treatment which causes disintegration of the thermoset resin.

It will now be appreciated that various modifications may be made both in the composition of the resin cement and in the method of manufacture. Hence, the above disclosure is to be interpreted as setting forth my preferred practice as well as the principles underlying the invention, and this disclosure is not to be interpreted as imposing unnecessary limitations on the appended claims.

I claim:

1. The method of making a faller bar comprising the steps of providing a metal bar having a continuous open groove extending longitudinally of the bar and a set of equal length tapered metal pins, each pin having a sharp point and a thick butt end, providing a narrow strip of stiff material which is penetratable by said pin points and is capable of holding said pins rigidly in position with the butt ends and pin points protruding, providing a support having a set of equally spaced parallel grooves to carry said pins, placing one of said pins in each groove with all points extending in one direction, mounting the strip close to the pointed ends of said pins in said grooves, forcing

said pins along said grooves and thrusting the pointed ends of the pins through said strip but leaving the butt ends projecting rearwardly and locating the projecting points of the pins in substantially one plane, roughening the butts of said pins, inserting said pin butts in said faller bar groove while the pins are held by said strip in a spaced and fixed relationship, filling said bar groove around the fixed pin butts with a liquid thermosetting resin which adheres to metal, curing the resin while the pins are held in place by said strip, to cement the fixed pins in said faller bar groove, said strip being heat resistant to the temperature of curing said resin, and thereafter curing the resin and removing said strip from the pins of the completed faller bar.

2. The method of claim 1 in which the strip of stiff material is a stiff, sponge-like and coarsely porous polystyrene resin.

3. The method of claim 2 in which the strip is cut by a tapered knife and the cut surfaces are thereby compressed and the surface pores are slightly sealed by frictional heat generated by the cutting operation.

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