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METHOD OF AND APPARATUS FOR NEUTRALIZING STATIC ELECTRICITY ON FILLING PICKS OF LOOMS AND THE LIKE

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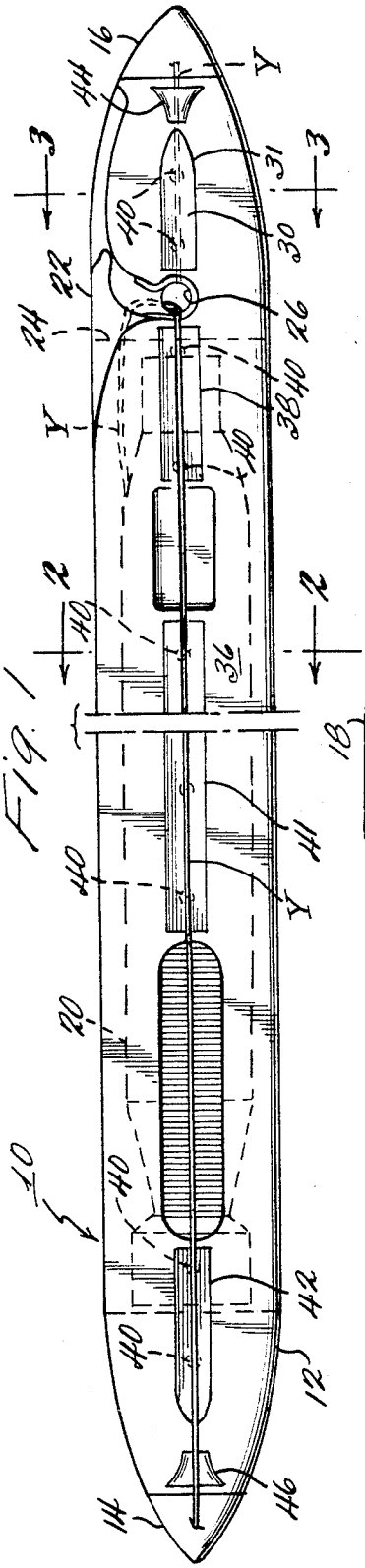


FIG. 1

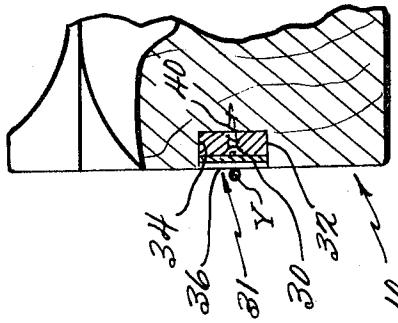


FIG. 3

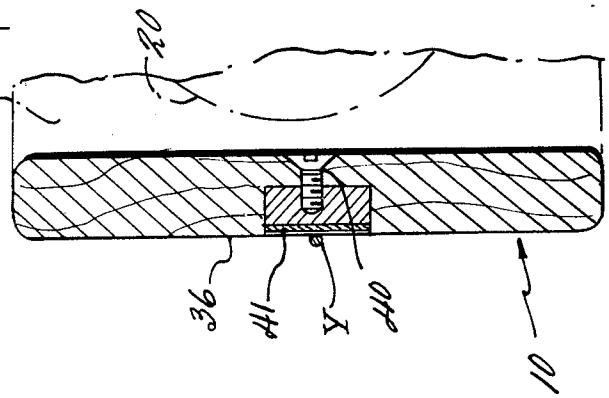


FIG. 2

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METHOD OF AND APPARATUS FOR NEUTRALIZING STATIC ELECTRICITY ON FILLING PICKS OF LOOMS AND THE LIKE

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The present invention relates to an improved method of as well as apparatus for eliminating or neutralizing a charge of static electricity on filling yarn during weaving of fabric on a loom. More particularly, the present invention relates to a method of eliminating static electricity from filling yarn in the shed of the loom as the filling yarn is laid into position as well as an improved shuttle for such elimination or neutralization of static electricity.

In weaving operations on high speed looms such as Draper looms, Crompton & Knowles looms and the like, the build-up of static electricity on the filling yarns is particularly noticeable and harmful especially when using yarns made from acetate rayon, nylon, rayon, Dacron, and the like. In the weaving of lightweight fabrics with a filling having acetate filaments, oftentimes the yarn has what is known in the industry as "zero twist." This type of yarn is particularly difficult to weave as any static electricity caused by the yarn passing through and rubbing against the eye of the shuttle causes the filaments of the yarn to open up and make defects in the woven fabric. Additionally, the filling yarn having static electricity thereon has a tendency to cling to any metal parts of the loom and thus a drag is placed on the filling yarn causing it to fly wildly or break, resulting in imperfections in the fabric and even in loom stoppage.

Heretofore manufacturers have put anti-static oils on the yarn but while these lubricants for eliminating static electricity do help in other places in the textile field, such as knitting, they have very little effect in the case of weaving as static electricity builds up on the filling yarn due to the tremendous speeds of the yarn passing over the shuttle eye. Heretofore radioactive eliminators have been tried in the textile field but such radioactive eliminators have been utilized only in the area of fiber formation into yarn such as at the drawing rolls of a spinning machine. One of the reasons radio-active eliminators have not been used elsewhere in the textile industry is that those heretofore used emitted beta and gamma rays which were hazardous to personnel. These rays could be effectively shielded in the application to spinning machines but not elsewhere. While the use of radio-isotopes has been utilized to eliminate or neutralize static during spinning, this does not have a permanent effect on the yarn and, thus, when the yarn is used as a filling, static electricity will again build up due to the fast speed of the yarn over a surface such as the shuttle eye.

An object of the present invention is to provide an improved method of weaving on a loom resulting in increased loom speed and yield as well as an improved woven fabric.

Another object of the present invention is to provide an improved method as well as apparatus for eliminating or neutralizing static electricity on filling yarn as the filling yarn is being laid in the warp yarn.

Still another object of the present invention is to provide an improved loom arrangement for eliminating or neutralizing static electricity in filling yarn in the area of the shed.

Ancillary to the proceding object it is a further object of the invention to provide an improved shuttle having means for eliminating or neutralizing static electricity from the filling yarn as the yarn is delivered therefrom.

The present method involves providing a field of ionized air in the immediate area where the filling yarn passes on each pick, this area being the shed between the warp threads. In the particular method of the present invention, the ionizing of the area within the shed may be accomplished in at least two ways. First, the field of ionized air may be developed on the shuttle of the loom forward and rearward of the shuttle's side delivery opening so that the yarn passing from the filling carrier of the shuttle through the shuttle eye and the side delivery opening must immediately travel through the area or zone of ionized air in either direction of movement of the shuttle on its picks so that the ionized air immediately neutralizes any static electricity charge on the yarn. While many isotopes will work for the purpose of eliminating static electricity, most of the isotopes contain beta and gamma rays which are harmful to human tissue. Consequently, an isotope was selected which issued only alpha rays that are harmless to human tissue. A preferred isotope is merchandized by Minnesota Mining and Manufacturing Company in St. Paul, Minn. and is identified as Polonium–210. This isotope, in the form described below, was applied to the side of the shuttle both forward and rearwardly of the side delivery opening.

The Polonium–210 is preferably utilized by impregnating it into ceramic microspheres. This is done by using a soluble Polonium salt, such as Polonium Nitrate or the like. The microspheres are filled with tiny cracks, making them porous and enabling them to receive the Polonium salt solution. The microspheres are about two thousandths of an inch in diameter. A single layer of the microspheres thus treated is adhered to a metal foil, such as aluminum, with the use of an epoxy resin. Polonium–210 has a half life of about 138 days, so that the Polonium has about six times the activity actually necessary, at the start of its use and it will be effective for from one to two years depending on the degree of use.

The metal foil, with Polonium-saturated micropheres thus prepared, was then placed on the side of the shuttle ahead of and behind the side delivery opening, with the foil being depressed slightly below the surface of the side of the shuttle so that it was not touched by the yarn dragging over it but yet could emit alpha rays to ionize air adjacent to the side of the shuttle.

The benefits resulting from utilizing the shuttle having Polonium–210 thereon as described above were many. First, the filling yarn fell in its intended place in the web of fabric being woven without distortion as any static electricity charge on the yarn had been neutralized. There was a reduction or elimination of "seconds" in the fabric produced on looms equipped with these shuttles. Additionally, it was found that shuttle speeds, i.e., the number of picks per minute, could be increased from 200 to approximately 240 per minute with less breakage of filling yarn occurring and a greater yield per loom. This resulted in a material savings in the cost of production.

The second means of accomplishing the above described method was realized by placing a bar of Polonium–210 on the reed cap of the loom, the bar extending across the reed cap and facing downwardly into the shed, within six inches and preferably about two inches above the lay. By positioning the bar of Polonium–210 on the reed cap, and facing it downwardly into the shed, the Polonium–210 emitted its alpha rays into the shed thereby ionizing the air in the area or zone of the shed so that when the shuttles passed back and forth through the shed on their picks, the filling yarn delivered from the shuttles had passed through the ionized air and thus, had any static electricity thereon neutralized. The advantages enumerated above with respect to use of Polonium–210 on a

shuttle also resulted with this installation of Polonium–210 on the reed cap in that shuttle speed was increased along with loom production and yet there was a corresponding decrease in "seconds" of the fabric produced.

The novel shuttle for accomplishing the improved method of weaving is disclosed in the drawings wherein:

FIGURE 1 is a side elevational view of the shuttle of the present invention with the filling carrier shown in broken lines;

FIGURE 2 is an enlarged fragmentary cross sectional view taken on the line 2—2 of FIGURE 1; and

FIGURE 3 is an enlarged fragmentary cross sectional view taken on the line 3—3 of FIGURE 1.

Referring now to the drawings wherein like characters or reference numerals represent like or similar parts, the shuttle **10** of the present invention includes a generally elongated body member **12** which is bullet-shaped at each of its ends. The body member **12** may be made of any suitable material but is usually made of wood or plastic. The loom points or bullet shaped ends of the body member **12** are provided with the usual steel protective covers **14** and **16**.

While the shuttle **10** is shown as a type more or less conventional in configuration, it will be appreciated by those skilled in the art that other types of shuttle configuration could be used.

The body member **10** is provided with a first elongated opening **18** for receiving the filling carrier **20** shown in broken lines in FIGURES 1 and 2. The filling yarn Y from the filling carrier **20** passes through suitable passages within the body member **12** to a shuttle eye **22** carried in a second opening **24** in the body member **12**. The shuttle eye **22** directs the filling yarn into a yarn passage opening to a side delivery opening **26** in the body member **12**. When the shuttle **10** is moving from the left toward the right of FIGURE 1, the yarn will be delivered from the side delivery opening **26** rearwardly of the shuttle as shown in full lines, whereas when the shuttle **10** is moving from the right to the left of FIGURE 1, the yarn will be delivered over the front portion of the shuttle as shown in broken lines.

As best shown in FIGURE 1, a foil **30** having microspheres containing Polonium–210 adhered thereto, is carried on a member **32** detachably secured in a groove **34** forwardly of the side delivery opening **26**. The insert **31** defined by foil **30** and member **32** is recessed slightly below the side surface **36** of the body member **12** so that the yarn passes over the foil **30** without contacting the same when the shuttle is moving to the left of the figure. By recessing the foil **30** slightly below the surface of the body member **12**, the yarn Y does not drag over the Polonium–210 foil and thus possibly damage the same and also there is less chance for the accumulation of dirt, body oils from fingers, and the like, to collect on the Polonium–210 foil when the shuttle **10** is handled.

A second insert **38** similar to the insert **31** in that it has Polonium–210 foil **30** and a detachable member **32**, is positioned just rearwardly of the side delivery opening **26** for creating an ionized field of air for the yarn Y to pass through when the shuttle **10** is moving from the left to the right of FIGURE 1. The inserts **31** and **38** may be detachably connected to the body member **12** by any suitable means such as screws **40**, cement, or the like.

While the second insert **38** is effective to neutralize any static charge on the yarn passing from the side delivery opening **26** when the shuttle is moving from left to right, additional detachable inserts **41** and **42** are provided in the side **36** of the body member **12** lengthwise of the same to further insure the neutralization of any static charge which might develop on the yarn should the yarn contact the side surface **36** of the body member **12**.

In addition to the inserts **31**, **38**, **41** and **42**, further inserts **44** and **46** may be positioned adjacent the bullet shaped ends of the shuttle **10** to add to the field or zone of ionized air through which the filling yarn Y passes as it is falling into its intended place in the web of fabric being woven.

The method and apparatus heretofore described and illustrated in the drawings fully and effectively accomplish the advantages of the present invention. It will be realized that the foregoing specific embodiments have been shown and described only for the purpose of illustrating the principles of this invention and are thus subject to some changes without departing from such principles.

Therefore, the terminology used in this specification is for the purpose of description and not limitation, the spirit and scope of the invention being described in the claims.

I claim:

1. A loom shuttle having an elongated body member with a first opening therein for accommodating a filling carrier and a second opening for receiving a shuttle eye for delivering yarn to a side delivery opening in the body, the improvement comprising: a first static electricity eliminating means comprised of a radio-isotope material emitting alpha rays positioned forward of said side delivery opening and carried on said body; and a second static electricity eliminating means comprised of a radio-isotope material emitting alpha rays positioned rearwardly of said side delivery opening on said body member whereby yarn leaving said shuttle on each pick is neutralized of any charge set up therein while traveling through the eye.

2. A shuttle as claimed in claim **1** wherein each of said means is an insert.

3. A shuttle as claimed in claim **2** wherein said radio-isotope material is Polonium–210.

4. A shuttle as claimed in claim **1** in which said radio-isotope material is on a foil.

5. An improved shuttle for a weaving loom comprising: an elongated body member having a first opening therein for accommodating a filling carrier and a second opening for receiving a shuttle eye, said body member further having a side delivery opening for delivering yarn from said filling carrier through said eye on each pick; and means comprised of a radio-isotope material for ionizing the air by alpha rays in the area where the yarn passes from the side delivery opening on said body member.

6. A shuttle as claimed in claim **5** in which said radio-isotope material is recessed slightly below the surface of said body member whereby the yarn passing from said side delivery opening is spaced from said radio-isotope material but passes through the air ionized by the rays emitted from said radio-isotope material.

7. A shuttle as claimed in claim **6** in which said mean is Polonium–210.

8. A shuttle as claimed in claim **5** in which said radio-isotope material extends substantially along the longitudinal length of a side of said body member forward of and rearward of said side delivery opening, said radio-isotope material being recessed in said body member slightly below the surface of said body member whereby yarn passing from said side delivery opening is out of contact with said radio-isotope material but passes through the air ionized by the rays emitted from said radio-isotope material.

9. A shuttle as claimed in claim **8** in which said radio-isotope material is Polonium–210 carried on a foil, said foil being carried on inserts detachably connected to said body member.

10. A method of weaving fabric on a loom utilizing shuttles for laying in the filling yarn between a shed formed by the warp yarn comprising the steps of ionizing the air by means of a radioactive isotope material within the shed and passing the filling yarn through the ionized air as the filling yarn is fed from the shuttle whereby static electricity on the filling yarn is neutralized.

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