Oct. 14, 1969 F. A. KOHLHAGEN 3,472,288

BOWLING PIN IMPACT CURTAIN

Filed Sept. 12, 1966

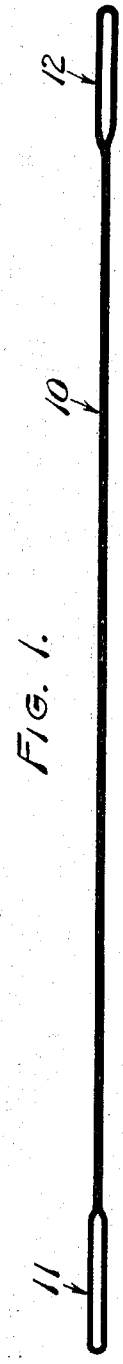


FIG. 1.

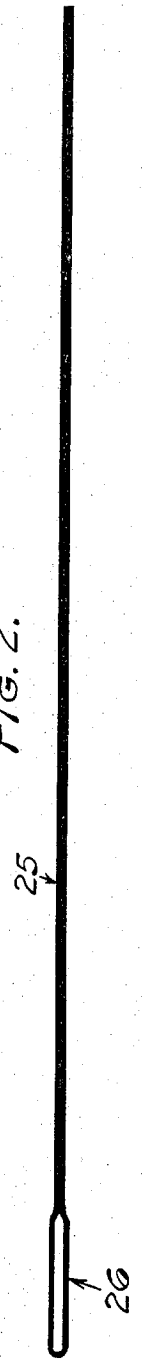


FIG. 2.

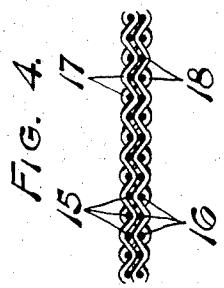


FIG. 4.

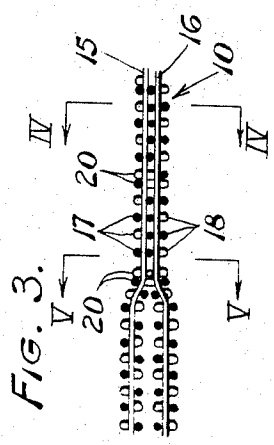


FIG. 3.

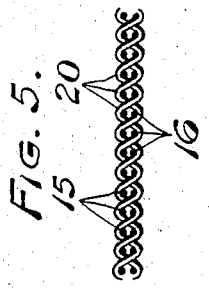
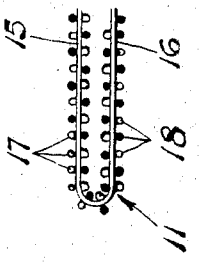


FIG. 5.



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BOWLING PIN IMPACT CURTAIN

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ABSTRACT OF THE DISCLOSURE

A bowling pin impact curtain comprised of an interwoven two ply fabric formed to include integral loop formations along both the upper and lower edges thereof. Such loop portions being formed without the use of extraneous joinder methods such as sewing, stitching, etc.

This invention relates to a novel bowling alley impact curtain, such curtain being conventionally suspended rearwardly of the pin areas of bowling alleys to receive the impact of bowling pins which fly rearwardly from the bowling alley when struck by bowling balls.

Impact curtains are most commonly used in conjunction with automatic pin spotting equipment in bowling alleys but may be employed wherever a device of this type is advantageous. Bowling pin impact curtains are usually suspended at their upper ends and extend downwardly or obliquely downwardly, usually being attached at their lower ends to a bowling ball cushion device which arrests the rearward movement of the bowling ball. An example of a bowling pin impact curtain is found in Koelliker Patent No. 3,079,155 dated Feb. 26, 1963. Bowling pin impact curtains are conventionally of fabric or like flexible material and, as shown in the aforesaid patent, may be attached at their upper edges by means of a loop formation which extends about a supporting horizontal rod. As also shown in the above patent, this loop formation is conventionally made by a return bent portion of the fabric being stitched upon itself to form the loop. In some arrangements a similar loop formation is employed along the bottom edge of the impact curtain.

Bowling pin impact curtains are usually arranged so that they hae some slack material to absorb and cushion the impact of bowling pins thereagainst and such curtains are obviously subjected to very substantial wear and stress due to the force of bowling pins continuously striking thereagainst.

The stitching normally employed in forming the return bent loops as shown in the above Koelliker patent are obviously subjected to a high degree of wear and stress and experience shows that stitching fails frequently and rapidly in bowling pin impact curtains in loop formations. In some impact curtain constructions the end loops are separately formed from leather or other material of greater strength than the usual fabric but here again, the loops must be applied to the body portions of the impact curtains and this is usually done by sewing or stitching and thus the real problem is not avoided.

While the impact curtain shown in the above Koelliker patent has a return bent loop formation along only its upper edge, impact curtain constructions wherein similar loops are also employed along the lower edge are frequently encountered. When that is the case similar problems of stitching failure and consequent short life are the rule rather than the exception.

The present invention provides a bowling pin impact curtain wherein the loop formation along the upper edge or along both the upper and lower edges comprises an integral woven part of the impact curtain without any sewing or stitching, or other extraneous joinder between the body portion of the curtain and the loop portion.

Speaking generally, the aims of the present invention are provided by weaving an impact curtain wherein the two ends of the loop merge into a multi-ply fabric portion which comprises the body of the impact curtain. Thus there is no joint whatever, whether loop formations are provided at one of both opposite edges of the impact curtain. The manner in which this unitary woven structure without joints or connections of any kind is achieved will be understood clearly from a consideration of the following specification which describes in detail a preferred mode of practicing the present invention, such specification being taken in conjunction with the accompanying drawing which illustrates representative modes of practicing the invention. While representative embodiments of the present invention are thus illustrated and described herein by way of example, it is to be understood that such embodiments are merely representative and that various modifications may be made in the method of producing the impact curtain of the present invention and in the structure thereof without departing from the principles of the invention, which principles are limited only as defined in the appended claims.

In the drawings:

FIG. 1 is a diagrammatic side edge view of one form of the impact curtain of the present invention;

FIG. 2 is a side edge view of another form of the impact curtain of the present invention;

FIG. 3 is an enlarged fragmentary cross-sectional view taken vertically through the top portion of an impact curtain according to either FIGS. 1 or 2 showing the integrally woven loop formation thereof;

FIG. 4 is a fragmentary cross-sectional view taken approximately on the line IV—IV of FIG. 3; and

FIG. 5 is a fragmentray cross-sectional view taken approximately on the line V—V of FIG. 3.

It is to be understood that the bowling pin impact curtain of the present invention, like that of the above-identified prior patent, is generally rectangular and of woven fabric. While bowling pin impact curtains may vary somewhat in size, the impact curtain here contemplated will run generally about sixty inches in the width dimension and about thirty inches in the height dimension. Since FIGS. 1 and 2 are diagrammatic side edge views of two forms of impact curtains these figures represent the thirty-inch dimension and, again speaking generally and merely by way of example, the integrally woven end loops extend for approximately three inches in from the outer upper edges of the impact curtains of FIGS. 1 and 2 and, in the case of FIG. 1, similar loop formations are provided along the bottom edges of the curtains. In FIG. 1 the central body portion of the impact curtain is designated generally by the reference numeral **10** and the top and bottom loop formations are designated generally **11** and **12**, respectively.

As will appear more clearly later herein, the body portion **10** of a bowling pin impact curtain woven in accordance with the present invention is substantially twice the thickness of the top and bottom loop portions **11** and **12**. This is by reason of the fact that the body portion **10** comprises two-ply woven fabric whereas the end loops each comprise snigle-ply woven fabric, although the weaving is continuous throughout the impact curtain, the single-ply fabric of the end loops merging into the two-ply fabric of the body portion in a manner which will presently appear.

In weaving conventional two-ply fabric the shuttle carries the weft thread or filler thread back and forth across the loom in the usual manner but in weaving two-ply fabric the weft threads in one direction comprise a separate layer with respect to the weft threads in the other direction for certain purposes. In such two-ply

fabric there are in reality two sets of warp threads, one of which is commonly referred to as the binder thread. More correctly, it may be said that there are three sets of warp threads, one set interweaving with the weft threads of one layer, the second set interweaving with the weft threads of the second layer, and the third set (the binder set) interweaving with the weft threads of both layers.

The weaving procedure followed in producing the novel impact curtain of the present invention is generally similar to that practiced in producing conventional two-ply woven fabric excepting that the third of the foregoing three sets of warp threads, that is the binder threads, are employed only in the midportion of the fabric body, namely the portion which makes up the two-ply integrally woven body portion **10** of the impact curtain of FIG. 1. Since the binder threads are not present in the end portions **11** and **12** which comprise the top and bottom loop formations of the impact curtain, such end portions form endless loops which merge integrally with the two-ply body portion of the fabric.

In the drawing FIG. 3 is a cross-section taken transversely of the fabric, that is, in a direction of the weft or filler threads. In FIG. 3 the numeral **15** designates filler or weft threads going in one direction and the numeral **16** indicates filler or weft threads going in the return direction, thus forming two layers of weft threads as indicated above. A set of wrap threads **17** is woven with the layer of weft threads **15** in the usual manner to form a layer of woven fabric. A second set of wrap threads **18** is interwoven with the weft threads **16** of the lower layer to form a second layer of woven fabric.

In the main body portion of the device of the present invention a third set of warp threads, called binder threads, is interspersed with the warp threads **17** and **18** and this third set of wrap threads, or binder threads, is designated **20** and is interwoven across both sets of weft or filler threads **15** and **16**.

It is to be understood that FIGS. 3, 4 and 5 are diagrammatic and that the several threads are actually somewhat closer together and more densely arranged than is indicated in these figures. For instance, in a representative fabric of the type employed for the novel bowling pin impact curtain of the present invention there may be sixty-four separate warp threads per inch in which case, since as shown in FIG. 3 a set of binder threads **20** is provided between each group of eight wrap threads **17** and **18**, there would be a pair of binder threads **20** every eighth of an inch throughout the body portion of the fabric. Of course, as indicated above, the binder threads **20** are not employed in the end portions of the fabric which form the loops **11** and **12**, such end portions being otherwise continuously woven with the main body portion of the fabric as clearly described above and illustrated in FIG. 3.

FIG. 4 shows the manner in which the two sets of warp threads **17** and **18** are separately interwoven with the two layers of weft or filler threads **15** and **16**. FIG. 5 shows the manner in which the third set of warp threads, the binder threads **20**, interweave with both layers of filler threads **15** and **16** throughout the central body portion of the impact curtain which is designated **10** in FIG. 1.

FIG. 2 shows an impact curtain which is the same as that of FIG. 1 excepting that the main two-ply body portion **25** has an integrally woven loop formation **26** at only one end thereof. This is accomplished merely by extending the binder threads **20** entirely to the right-hand edge of the fabric as shown in FIG. 2, the left-hand end of the device of FIG. 2 being the same as shown in detail in FIG. 3.

It is to be understood that an impact curtain woven in accordance with the foregoing principles may consist of any combination of natural or synthetic yarn, either spun yarn or of mono-filament, and may be impregnated or coated as desired. For instance, and merely by way of example, in one form of the fabric of the present invention the warp threads **17** and **18** are of cotton while the weft or filler threads **15**, **16** are of nylon and the binder threads **20** are likewise of nylon.

While the foregoing description refers to end loops of single-ply fabric and a central body portion of two-ply fabric, it is to be understood that the same weaving principles may be applied with multiples of this arrangement. For instance, the end loops **11** and **12** may be of two-ply fabric and the main body portion **10** of four-ply fabric.

Various other modifications of the foregoing invention will occur to those skilled in the weaving art and it is to be understood that such modifications are intended to fall within the principles and scope of the present invention.

What I claim is:

1. A bowling pin impact curtain comprising a two ply woven fabric body portion and an integral continuous loop portion along at least one edge thereof, one ply of said fabric extending from the two ply body portion to form said loop and thence returning to merge continuosly with the other ply of said body portion, said curtain having weft threads extending back and forth across the fabric in continuous loop form to form two layers of weft threads, warp threads woven with the weft threads of each layer to form a seamless tubular single ply fabric consisting of two layers, and a second set of warp threads engaging the weft threads of both layers throughout said body portion to form continuous integrally woven two ply fabric, said second set of warp threads stopping short of at least one edge of said fabric to form said loop of continuous single ply fabric.

2. A bowling pin impact curtain according to claim **1** wherein said second set of warp threads stop short of the opposite edges of said fabric to form continuous loops of single ply fabric at such opposite edges.

3. A bowling pin impact curtain according to claim **1** wherein the warp threads of said second set are interspersed with the first mentioned warp threads throughout said body portion to form continuous integral two ply woven fabric in said body portion.

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U.S. Cl. X.R.

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