

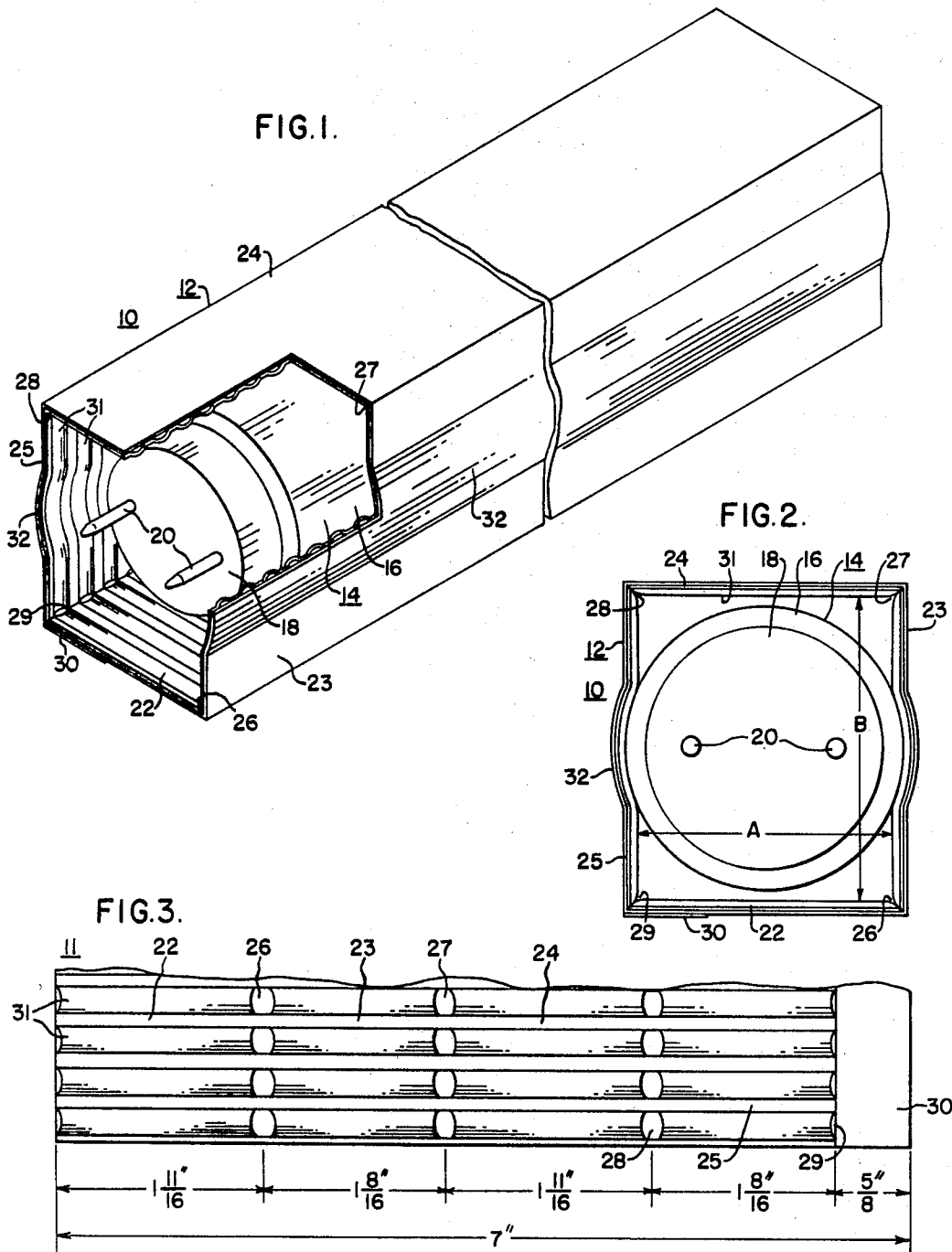
Nov. 4, 1969

J. E. MILLS ET AL
PROTECTIVE WRAPPER FOR TUBULAR ARTICLES SUCH AS
FLUORESCENT LAMPS AND THE LIKE

3,476,235

Filed July 3, 1968

2 Sheets-Sheet 1



WITNESSES

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Nov. 4, 1969

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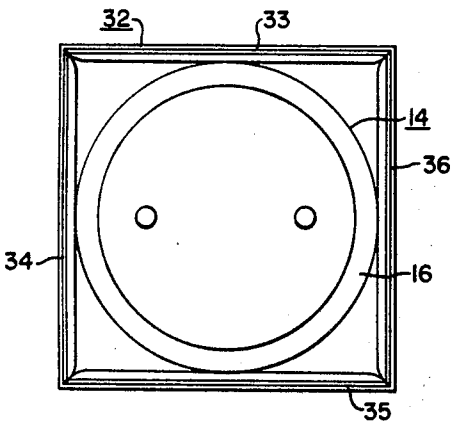


FIG. 4.

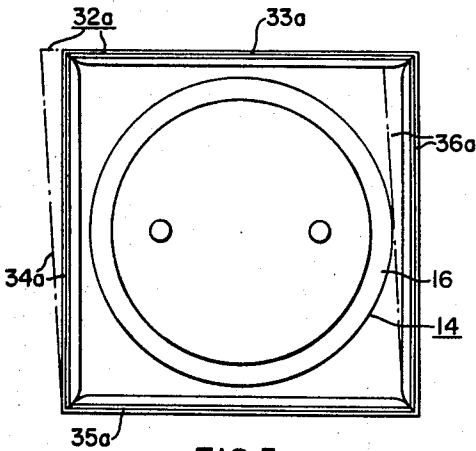


FIG. 5.

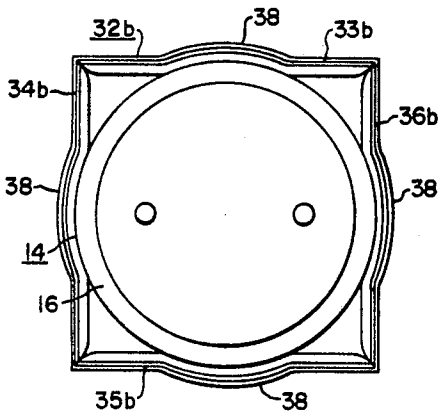


FIG. 6.

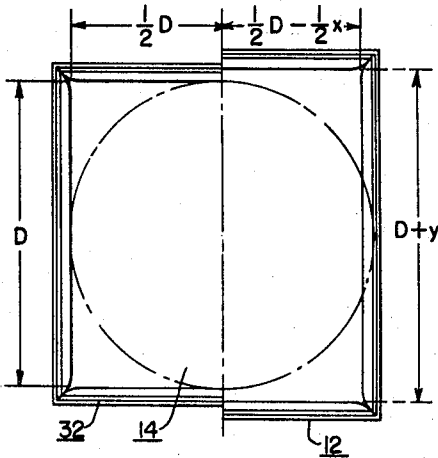


FIG. 7.

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**PROTECTIVE WRAPPER FOR TUBULAR ARTICLES
SUCH AS FLUORESCENT LAMPS AND THE LIKE**
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Filed July 3, 1968, Ser. No. 742,290
Int. Cl. B65d 85/30, 3/04, 5/56

U.S. Cl. 206—46

10 Claims

ABSTRACT OF THE DISCLOSURE

A protective wrapper comprising a tubular four-sided open-ended paper sleeve that is of rectangular rather than square cross-section. The width dimensions of the side walls of the wrapper are so correlated relative to the size of the fluorescent lamp (or other article) that the inside major and minor width dimensions of the rectangular cross-sectioned sleeve are less than and greater than, respectively, the outside diameter of the lamp or article. The resulting "loose fit" in one direction and "tight fit" in the other direction effected by the wrapper with the inserted lamp frictionally retains the lamp in place within the wrapper and automatically compensates for variations in thickness of the packaging material, width dimensions of the side walls, etc. which occur during manufacture and caused the prior art square cross-sectioned wrappers either to fit too tightly and split when slipped over the lamp, or to fit too loosely and permit the inserted lamp to fall out of the wrapper when being placed in the shipping container or subsequently handled by the store clerk or perspective customer.

Background of the invention

This invention relates to the protective packaging of fragile articles and has particular reference to an improved paper wrapper for packaging fluorescent lamps having glass envelopes.

In order to protect fluorescent lamps from breakage during shipment it is necessary that they be separated one from another by suitable packaging material. This is customarily achieved by inserting the lamps into four-sided open-ended wrappers or sleeves of corrugated paper which snugly and frictionally grip the lamp envelopes and are securely locked in place. It has been the prior art practice to make the walls of such wrappers equal in width so that the resulting sleeve, when erected, provides a lamp-receiving compartment that is of square cross-section and slightly smaller than the outside diameter of the lamp envelope. A lamp wrapper of this type that is provided with an integral rip cord disposed along one of the corner edges of the sleeve is disclosed in U.S. Patent No. 2,798,596 issued July 9, 1957 to K. Emmons.

While such square cross-sectioned wrappers were satisfactory from a protection standpoint, they presented serious packaging and merchandising problems in that variations in the paper thickness, dimensions of the side wall panels, etc. which inherently occur during mass production of the wrappers on high-speed automatic machines frequently caused the inside dimensions of the wrapper to be larger or smaller than the outside diameter of the lamp envelope. If the wrapper is too large then the inserted lamp will not be retained within the wrapper and will slip out and fall to the floor when the sleeved lamp is being packed in the factory or is being handled by the prospective customer. On the other hand, if the wrapper makes too tight a fit with the lamp the operator has a very difficult time sleeving the lamp in the factory

and frequently finds it impossible to insert the lamp without splitting the wrapper.

In an effort to minimize these problems, which have been prevalent in the fluorescent lamp industry for many years and have generated frequently operator and customer complaints, the manufacturing tolerances have been made as tight as possible. However, the problems and complaints persist.

Summary of the invention

It is accordingly the general object of the present invention to provide an improved inexpensive protective wrapper for fragile tubular articles, such as fluorescent lamps, that will eliminate the aforementioned problems encountered with the prior art wrappers.

A more specific object is the provision of a paper wrapper which can be rapidly and easily slipped over a fluorescent lamp or similar article and yet tightly grip the latter and retain it in place within the wrapper.

Still another object is the provision of a fluorescent lamp wrapper that can be efficiently manufactured from single-face corrugated paper on existing high-speed automatic wrapper-making machines and is so constructed that it can be collapsed for bulk shipment from the supplier to the lamp factory and then be quickly and securely locked in place on the lamp by the packaging operator.

A further object is the provision of a package consisting of a fluorescent lamp or similar article and such a wrapper (or series of wrappers) that encloses the lamp, protects it from mechanical impacts and glass-to-glass contact with other lamps during shipment and permits the package to be handled without any danger of the lamp falling out of the wrapper.

The aforesaid objects and other advantages are achieved in accordance with the present invention by altering the width dimensions of the side walls of the wrapper in such a manner that the article-receiving compartment is of rectangular rather than square cross-section. In the particular case of a fluorescent lamp, one pair of opposed side walls is made slightly wider than the other pair of opposed side walls so that the inside minor dimension of the rectangular open-ended sleeve is slightly smaller than the outside diameter of the lamp envelope, and the inside major dimension of the sleeve is slightly larger than the outside diameter of the lamp envelope. Thus, when the lamp is inserted into the wrapper it makes a snug fit with and is frictionally gripped by one pair of the opposed side walls of the wrapper and is spaced from or merely rests against the other set of opposed side walls.

The relative dimensions of the rectangular cross-sectioned wrapper and the outside diameter of the lamp are such that a tight fit between the bulb and wrapper is insured despite variations in paper thickness, the widths of the side wall panels, bulb diameter etc. within the prescribed tolerances which occur during manufacture. Thus, by making small but critical changes in the cross-sectional dimensions and configuration of the wrapper, the unpredictable dimensional variations which are unavoidably encountered during manufacture are automatically compensated for without destroying or even impairing the ability of the wrapper to grip and frictionally lock the inserted lamp in place.

Brief description of the drawings

A better understanding of the invention will be obtained by referring to the accompanying drawing, wherein:

FIGURE 1 is a fragmentary perspective view of a fluorescent lamp that is protectively enclosed in the improved wrapper of this invention, a corner portion of the

wrapper being removed to illustrate the manner in which it grips the lamp and firmly holds it in place;

FIG. 2 is an enlarged end elevational view of the lamp package shown in FIG. 1;

FIG. 3 is a fragmentary plan view of the paper blank from which the wrapper shown in FIGS. 1 and 2 is manufactured;

FIGS. 4-6 are end elevational views of prior art lamp packages illustrating a perfectly fitting wrapper, a loose fitting wrapper and a tight fitting wrapper, respectively; and

FIG. 7 is a fragmentary composite end view of a prior art wrapper and the improved wrapper illustrating the differences in the dimensions of the side walls relative to each other and the outside diameter of a fluorescent lamp envelope which is shown in dotted outline.

Description of the preferred embodiment

While the present invention can be used with advantage in protectively packaging various types of fragile articles that have at least one segment which is substantially circular in cross-section, it is especially adapted for use with tubular fluorescent lamps and it has accordingly been so illustrated and will be so described.

As is shown in FIG. 1, a lamp package 10 embodying the present invention consists of an open-ended rectangular cross-sectioned paper sleeve or wrapper 12 that is slipped over and protectively encloses a fluorescent lamp 14. The lamp 14 includes the usual tubular glass envelope 16 that is of circular cross-section and sealed and provided at each end with a base member 18 from which a pair of terminal pins 20 protrude. The wrapper 12 is fabricated from single-face corrugated paper that is divided into a series of side walls 22, 23, 24 and 25 by score lines 26, 27 and 28 which, in conjunction with the juncture formed by the cut end 29 of the corrugated sheet and anchored glue flap 30, provides hinged joints which permit the wrapper 12 to be folded flat for bulk shipment from the supplier to the lamp manufacturer. The wrapper 12 is the same length as the overall length (pin-to-pin dimension) of the lamp 14 so that the latter is protected along its entire length.

As will be noted in FIG. 1, the corrugated surface of the paper from which the wrapper 12 is made constitutes the inner surface of the wrapper and the flutes or corrugations 31 extend transversely of, and preferably at right angles to, the axis of the lamp 14 and, thus, the longitudinal axis of the wrapper 12. In accordance with the present invention the inside minor width dimension A (FIG. 2) of the rectangular cross-sectioned wrapper 12 is slightly smaller than the outside diameter of the bulb 16. This minor width dimension is controlled by the widths of the opposed side walls 22 and 24, by the thickness of the single-face corrugated paper and the height of the corrugations 31 which are used. In contrast, the inside major width dimension B of the wrapper 12 (which is similarly determined by the paper thickness, corrugation height and width of the remaining opposed side walls 23 and 25) is slightly larger than the outside diameter of the bulb 16. The inside dimensions of the wrapper 12 compared to the diameter of the lamp envelope 16 are, accordingly, such that the envelope presses against the central portions of the side walls 23 and 25 and causes them to bulge outwardly (as indicated by the reference numerals 32 in FIG. 1) when the lamp 14 is inserted into the wrapper. The inherent rigidity of the corrugated paper is such that the opposed walls 23 and 25 snugly and frictionally grip the lamp envelope 16 and securely retain the lamp 14 in its inserted position within the wrapper 12.

As will be noted more particularly in FIG. 2, retention of the lamp 14 within the wrapper 12 is achieved even though the widths of the side walls 23 and 25 are such that the lamp envelope 16 is spaced from or (in the case of a wrapper at the "small" end of the tolerance range)

merely touches the other side walls 22 and 24. Tests have shown that the lamp 14 is securely locked within the wrapper 12 despite the variations in paper thickness, flute heights, and width dimensions of the side walls that normally occur during the manufacture of the wrapper. The outward bulges 32 caused by the outward pressure exerted by the inserted lamp 14 are so small that they are not objectionable either from an appearance or packing standpoint.

In FIG. 3 there is shown one end of an integral cut-and-scored paper blank 11 from which the wrapper 12 is fabricated. As a specific example, the dimensions of the various panels which have been found suitable for a fluorescent lamp having an envelope $1\frac{1}{2}$ inches in diameter (T12) are indicated in this figure. As shown, the blank 11 is made of single-face corrugated paper that is divided into the side wall panels 22, 23, 24, and 25 by score lines 26, 27 and 28 which extend parallel to one another at right angles to the corrugations 31. The corrugated sheet is terminated along a line 29 that parallels the score lines and the facing sheet extends a small distance therebeyond to provide a glue flap 30 that extends the full length of the blank. As noted, in the case of a T12 bulb the width of the narrow panels 23 and 25 is approximately $1\frac{5}{16}$ inches, the width of the broad side wall panels is $1\frac{11}{16}$ inches, and the width of the glue flap 30 is $\frac{5}{8}$ of an inch so that the overall width of the blank is 7 inches.

The wrapper 12 is formed in the usual manner by progressively bending the blank 11 along the score lines and securing the glue flap 30 in overlapping relationship with the adjacent smooth-face edge portion of the wall 22, as is shown in FIGS. 1 and 2. The flutes 31 are approximately $\frac{1}{16}$ of an inch high so that the inside dimensions of the rectangular sleeve formed by the wrapper 12, when fully erected, is approximately $1\frac{3}{8}$ inches by $1\frac{1}{16}$ inches.

In FIG. 4 there is shown an ideal or "perfectly fitting" prior art wrapper 32 that is of square cross-section. The side walls 33, 34, 35 and 36 are of equal width and so dimensioned that they each make a snug fit with and frictionally grip the envelope 16 of the inserted fluorescent lamp 14. Due to the variations in the thickness of the paper and width dimensions of the walls which inevitably occur during manufacture of the wrapper, ideal wrappers and "perfect fits" of this character are very difficult and very infrequently obtained. As a result, the prior art wrappers are either too large or too small relative to the outside diameter of the lamp envelope 16. In the case of a prior art wrapper 32a which is too large (shown in FIG. 5), the side walls 33a, 34a, 35a and 36a are spaced from the lamp envelope 16 when the lamp 14 is centrally located within the wrapper. The lamp accordingly falls out of the wrapper, even though the wrapper loses its shape and assumes the form of a parallelogram, as indicated by the dotted line portions of FIG. 5.

In the case of a prior art wrapper 32b which is too small (shown in FIG. 6), the central portions 38 of each of the side walls 33b, 34b, 35b and 36b contact the bulb 16 and bulge outwardly. The forces resisting the insertion of the lamp 14 are so great that, at best, lamp insertion can be achieved only with the utmost difficulty, and at worst, the stresses produced in the paper cause it to split and tear.

The novel concept of the present invention is clearly shown in the composite illustration of an "ideal" prior art wrapper 32 and the improved wrapper 12 depicted in FIG. 7. As there shown, the prior art square cross-sectioned wrapper 32 (in the ideal case) has side walls that are of exactly the same width and dimensioned so that both of the inside dimensions of the wrapper are just slightly less than the outside diameter D of the lamp 14. In contrast, the rectangular cross-sectioned wrapper 12 of the present invention has side walls of unequal width that are so correlated that the inside minor dimension of the wrapper is smaller than the outside diameter D of the

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lamp 14 by an increment x ($\frac{1}{8}$ of an inch in the case of a wrapper for a T12 bulb), and the inside major dimension of the wrapper is larger than the lamp diameter D by an increment y ($\frac{1}{16}$ of an inch for a T12 lamp).

It will be appreciated from the foregoing that the objects of the invention have been achieved in that a novel and inexpensive protective wrapper for packaging fluorescent lamps and similar fragile tubular articles has been provided which inherently effects a snug "grip-fit" with the inserted lamp despite the dimensional variations encountered in the manufacture of the packaging material, wrappers and lamps under mass-production conditions.

While one embodiment has been illustrated and described, it will be understood that various changes, in construction and the selection of packaging materials can be made without departing from the spirit and scope of the invention. For example, the material from which the wrapper is fabricated need not be corrugated paper, as in the disclosed embodiment, but may be cardboard, foamed plastic in sheet form, or even a single-face corrugated composite that is composed of plastic.

In addition, the invention is not limited to fluorescent lamps, or lamps that are of uniform circular cross-section throughout their length. The improved wrapper can be used to protectively enclose any tubular article that is of substantially circular cross-section at its largest dimension. It can also be used to package so-called "Power Groove" type fluorescent lamps and similar articles which, have a series of spaced indents in their outer surface. In this case, the wrapper is preferably of such length that it spans and frictionally grips adjacent circular portions of the article.

In the case of fluorescent lamps that are 48 inches or longer in length, two or more wrappers can be used and placed end-to-end over the lamp—the length of the individual wrappers being such that their combined length is equal to the overall length of the lamp.

We claim as our invention:

1. The combination comprising:

an elongated article having at least one segment that is substantially circular in cross-section and defines the maximum cross-sectional dimension of said article, and

an open-ended tubular wrapper disposed in protective enclosing relationship with said article and overlying the circular cross-sectioned segment thereof, said tubular wrapper comprising two pairs of joined oppositely-disposed side walls that are unequal in width and are so dimensioned and arranged that the wrapper is of generally rectangular cross-section and only one of said pair of oppositely-disposed side walls snugly and frictionally grips the circular cross-sectioned segment of the article and retains the wrapper in place on said article.

2. The combination of claim 1 wherein:

said article includes a plurality of segments that are of uniform circular cross-section and are spaced from one another, and

the protective wrapper spans and frictionally grips at least two of the circular cross-sectioned segments of said article.

3. The combination of claim 1 wherein:

said article is of uniform circular cross-section throughout substantially its entire length, and said tubular wrapper is composed of paper and is of substantially the same length as the article.

4. The combination of claim 1 wherein:

said article comprises an electric lamp that has a tubular vitreous envelope of substantially uniform circular cross-section, and

said wrapper is fabricated from single-face corrugated paper the corrugations whereof are disposed on the inner face of the wrapper and extend transversely of the lamp axis.

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5. The combination of claim 4 wherein:

said lamp comprises a fluorescent lamp having a base at each end,

the corrugations of said paper wrapper are disposed at approximately right angles to the axis of the lamp, the dimensions of the rectangular cross-sectioned compartment defined by the wrapper are such that the minor width dimension of the compartment is smaller than the outside diameter of the lamp envelope and the major width dimension of the compartment is larger than the outside diameter of the lamp envelope, and

said wrapper is substantially equal in length to the overall length of the lamp.

6. The combination of claim 5 wherein:

the outside diameter of the fluorescent lamp envelope is approximately $1\frac{1}{2}$ inches,

the inside minor width dimension of the rectangular wrapper is approximately $1\frac{3}{8}$ inches, and

the inside major width dimension of the rectangular wrapper is approximately $1\frac{1}{16}$ inches.

7. The combination of claim 5 wherein:

the overall length of the fluorescent lamp is greater than that of said wrapper,

a plurality of such wrappers are disposed in end-to-end relationship on said lamp, and

the length of the individual wrappers are such that the combined length of said wrappers is substantially equal to the overall length of the lamp.

8. A wrapper for protectively packaging a fragile tubular article such as a fluorescent lamp or the like that is substantially circular in cross-section, said wrapper comprising:

an open-ended sleeve defined by two pairs of said walls that are joined to one another and are of unequal width so that the sleeve defines an article-receiving compartment that is rectangular in cross-section, the difference in the width dimensions of said pairs of side walls being such that the inside minor width dimension of the sleeve is less than the maximum outside diameter of said article and the inside major width dimension of the sleeve is greater than the maximum outside diameter of said article.

9. The wrapper of claim 8 wherein said side walls constitute parts of an integral cut-and-scored blank, and said sleeve is collapsible.

10. The wrapper of claim 9 wherein:

said sleeve is fabricated from single-face corrugated paper the corrugated side whereof comprises the inner surface of the sleeve and is so oriented that the corrugations extend transversely of the longitudinal axis of the sleeve, and

the width dimensions of said pairs of side walls are such that the rectangular article-receiving compartment defined by said sleeve, when erected, has an inside minor width dimension of approximately $1\frac{3}{8}$ inches and an inside major width dimension of approximately $1\frac{1}{16}$ inches.

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U.S. Cl. X.R.

217—52; 229—14, 93