June 3, 1969 J. H. DANZER 3,447,207

STRAPPING DEVICE

Filed July 25, 1967

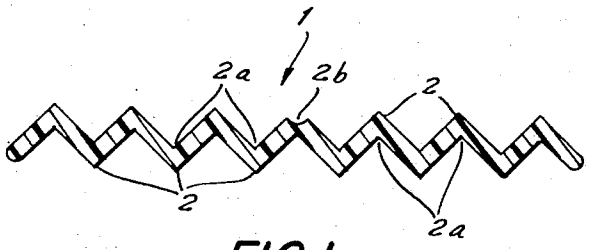

FIG. 1

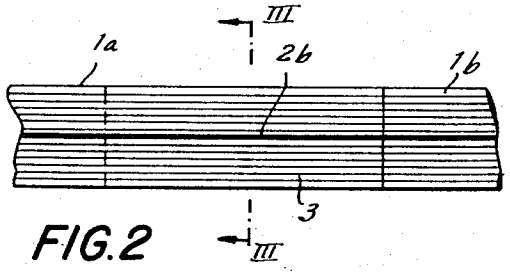

FIG. 2

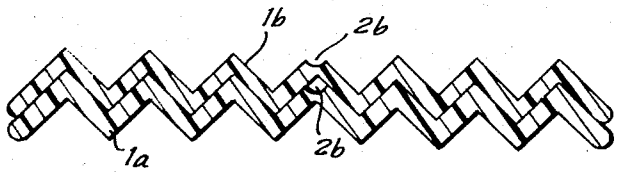

FIG. 3

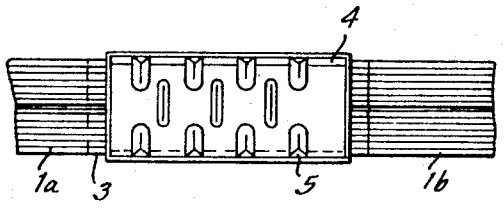

FIG. 4

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STRAPPING DEVICE

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U.S. Cl. 24—16 9 Claims

ABSTRACT OF THE DISCLOSURE

An elongated band of plastic material includes two transversely spaced longitudinal edge portions. In transverse tranversely spaced longitudinal edge portions. In trasverse cross section the band has an undulatory configuration. The band is provided with at least one strip-shaped weakened portion extneding intermediate the edge portions in substantial parallelism therewith to thereby permit severing of the band along this weakened portion.

Background of the invention

The present invention relates to the packaging of bales and similar packages, and more particularly to strapping devices for strapping such packages. Still more particularly, the present invention relates to a strapping band.

It is well known to strap bales and analogous packages by placing a band, consisting for instance of metal or synthetic plastic material, about the package to be so secured, drawing the band tight and securing its overlapping end portions. Strapping bands of synthetic plastic material, with which the present invention is particularly concerned, are known and are manufactured by extrusion, either in form of foils from which straps of the desired width are severed, or else they are extruded in form of strips or bands having already the desired width. Because these straps must be applied with manually or power-operated strapping equipment, and because such equipment is designed to accept straps of a predetermined width, it is necessary that the straps always have the required width because they cannot otherwise be utilized with the equipment.

Plastic strapping bands heretofore known are smooth-surfaced and a constant problem with such bands has been the displacement which takes place, for instance as a result of shaking of the bale or package during transport, or for other reasons, which sometimes even ends in slipping-off of the strapping band from the package. The reason for this is, of course, that the smooth surfaces of the strapping band do not provide adequate frictional resistance against such shifting.

This, however, is by no means the only area in which known plastic strapping bands leave something to be desired. Another disadvantage is the fact that, when the ends of the band are overlapped to be secured by crimping, welding, via an adhesive or in some other manner, a transverse displacement or offsetting of the overlapping ends with reference to one another frequently takes place during the joining operation. Thus, the ends cannot be in full surface to surface contact and the connection obtained is weakened. Also, conventional plastic strapping bands are subject to damage, for instance if an object having a sharp corner pushes against them with this corner during transportation of the bale or package which is so strapped, or during storage or in some other circumstance. Such contact can result in cutting or deep scratching of the band, whereby the latter is weakened and proper securing of the package or bale is endangered.

Finally, there are the additional disadvantages that the smooth surfaces of conventional plastic strapping bands make mechanical connections of the overlapping ends of the band relatively unsafe because, in the absence of adequate friction between the engaging surfaces of the overlapping ends of the band, the ends can be relatively easily drawn apart. The other factor in need of improvement resides in the fact that it is impossible to longitudinally subdivide conventional plastic strapping bands if the need arises, unless special equipment for this purpose is provided. Such equipment is not, of course, available under many circumstances so that the utility of such conventional bands is significantly limited by this factor.

Summary of the invention

The present invention overcomes the disadvantages set forth above, and provides the advantages which have been indicated as desirable.

More particularly, the present invention provides an elongated strapping band of synthetic plastic material which is not subject to the aforementioned disadvantages.

The strapping band or strapping device according to the present invention is no more complicated to manufacture, and is therefore no more expensive than conventional plastic strapping bands, but provides all of the desirable advantages outlined above.

In accordance with one feature of my invention I provide a strapping device, particularly for strapping bales and similar packages, which comprises an elongated band of synthetic plastic material. The band includes two transversely spaced longitudinal edge portions and has in transverse cross section an undulatory configuration. It is provided with at least one strip-shaped weakened portion which extends intermediate the edge portions in substantial parallelism therewith so that the band can be severed along the weakened portion without requiring the provision of special equipment for this purpose.

By making my novel band of resiliently yieldable synthetic plastic material, and by giving it in transverse cross section an undulatory configuration, that is alternating crests and valleys, I assure that, if an object having a sharp corner or the like is pressed against the band in a manner which would hitherto have resulted in damage to the band, the band will be able to yield to some extent without sustaining any damage, however. If the pressure continues even after the band has yielded to the maximum possible extent, any cuts which might occur can occur only on the crests of the longitudinally extending ridges which define between themselves the waves or depressions, and this significantly reduces the extend by which such damage can weaken the novel band.

By roughening the surfaces, or at least one surface of the band, in longitudinal direction, in transverse direction or in both of these directions of the band in a suitable manner well known to those skilled in the art, I overcome the previous tendency of overlapping ends of the band to slip apart.

Also, by giving the band undulatory configuration in its cross section I assure proper alignment of the overlapping ends, so that transverse slippage of the ends, and the manner in which this is so common in the conventional plastic strapping bands, is impossible.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawing.

Brief description of the drawing

FIG. 1 is a somewhat schematic cross section through a band incorporating my invention;

FIG. 2 is a fragmentary view showing opposite ends of my novel band overlapped ready for being secured together;

FIG. 3 is a section taken on the line III—III of FIG. 2; and

FIG. 4 is a view similar to that of FIG. 2, but showing the overlapping end portions of the band secured together.

Description of the preferred embodiments

Discussing now the drawing in detail, and firstly FIG. 1 thereof, it will be seen that my novel strapping band **1**, which must of course be understood to be of elongated strip-shaped confiuration, is of undulatory configuration, as seen in cross sectional view. Thus, it is provided on both sides with a plurality of longitudinally extending ridges **2** which alternate with grooves between them. Each of the ridges on one side is backed by a complementary groove **2***a* on the opposite side of the band. To facilitate severing of the band if it is desired or necessary to utilize a narrower strapping band, or if only a single band is available but two such bands are required, my novel strapping band shown in FIG. 1 is provided with at least one longitudinally extending weakened portion **2***b* which, in the embodiment illustrated in FIG. 1, is a depression extending along the crest of one of the ridges **2**. This makes it possible to sever the band **1** along the weakened portion **2***b* without requiring special equipment for this purpose. It is evident, of course, that I can provide two or more such weakened portions, depending on the width of the band **1**, and on how many narrower sections it is desired to obtain by severing the band **1**.

FIG. 2 shows the two opposite edge portions **1***a* and **1***b* of my novel strapping band overlapped, preparatory to being secured together. The zone in which they overlap is indicated with reference numeral **3** and it will be clear that the securing is effected in this zone, for instance by welding, by means of adhesive, by crimping, by a mechanical connector, or in any well known manner.

FIG. 3, which is a section taken on the line III—III of FIG. 2, shows how the grooves and ridges of the end portion **1***a* interlock with the grooves and ridges of the end portion **1***b*, thus preventing lateral displacement of the end portions **1***a* and **1***b* with reference to one another, as has been found undesirable in strapping bands according to the prior art.

FIG. 4, finally, shows the overlapped end portions **1***a* and **1***b*, similar to the showing in FIG. 2. However, in addition FIG. 4 shows a mechanical crimp-connector **4** applied in the region of the overlapped zone **3**. This connector **4** is provided with crimp tongues or projections **5** which are pressed inwardly against the material of the end portions **1***a* and **1***b* in the well known manner which need not be further described.

To facilitate adhesion of the overlapped end portions to one another, and to prevent their sliding apart, I roughen the surfaces of the strip, or at least one of these surfaces, in a suitable manner, and at least in the region of the end portions **1***a* and **1***b*. This can be effected in a variety of ways well known in the art, and can be either in transverse direction of the strip, in longitudinal direction of the strip, or both directions if desired.

It will be evident that the ability to elastically yield assures that the novel band according to my present invention cannot be readily damaged by contact with a hard sharp edge or the like, because the band will yield under such circumstances. Even if damage does occur, however, it will occur on the crest of the respective ridges **2** and will thus have less of a tendency to weaken the structural integrity of the band than would otherwise be the case.

To produce the band shown in the drawing, I extrude a mass of suitable synthetic plastic material through an extruder die whose outlet has a cross sectional configuration corresponding to the desired undulatory configuration of the band. Such configuration may be undulate in general, it may be zig-zag, or the like. By providing a suitable projection extending across the outlet of the die the band is formed with the weakened portion or portions **2***b* as it is being extruded from this outlet. In accordance with the invention the height of the outlet of the extruding die, that is the spacing between the crests of oppositely directed ridges, is greater than the spacing which is desired in the final band.

The strip-shaped blank which is obtained on extruding the synthetic plastic material from this die is subjected to a first longitudinal stretching operation whereby to obtain a preorientation of the macromolecular structure. Thereupon, the blank is cooled or permitted to cool to room temperature, reheated and again stretched or drawn, cooled, reheated and again stretched, and then cooled. This cooling is not of the entire band at the same time, but rather is effected zone by zone, that is in increments, and during this time the band is maintained in stretched condition. Finally, the band is again heated and again cooled to stabilize its molecular structure. All of this takes place in a continuous manufacturing process and the longitudinal stretching results not only in longitudinal orientation of the macromolecules and therefore in high tensile and breaking strength, but also in thermal stability against shrinking and in reduction of the thickness of the band to the desired final thickness. Because of the particular cross sectional configuration I have selected for my band, the actual cross sectional thickness of the material, as compared to the overall thickness of the band as seen in cross section and resulting from the undulatory configuration of the band, can be less than would otherwise be required. Thus I obtain higher break resistance relative to the amount of material required than would otherwise be the case, and it will be understood that this is because most all of the macromolecules are oriented in the longitudinal direction of the band.

The advantages of the novel band have already been outlined. It should also be pointed out, in addition, that the provision of the crests on the ridges serves to prevent undesired sliding of the band on the bale or package on which it is used. Also, the surface areas which come in contact when the end portions **1***a* and **1***b* are overlapped are of course larger in my novel construction than would be the case if the band were flat as is known from the prior art. This makes for better and more reliable adjoining of the end portions **1***a* and **1***b* by means of adhesive or by welding.

Thermoplastics for instance polyethylene, polyisobutylene are the plastic materials suitable for the novel strapping band.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of bands differing from the types described above.

While the invention has been illustrated and described as embodied in a strapping band, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. A strapping device for strapping bales and similar packages, comprising an elongated synthetic plastic band of zig-zag shaped transverse cross-section and including two transversely spaced longitudinal edge portions, said band being provided with at least one strip-shaped weakened portion extending intermediate said edge portions in substantial parallelism therewith whereby to facilitate severing of the band alon gsaid weakened portion.

2. A strapping device as defined in claim 1, wherein said band has two oppositely directed major surfaces, and wherein at least portions of said major surfaces are of other-than-smooth surface texture.

3. A strapping device as defined in claim 2, wherein each of said surfaces is provided with a plurality of longitudinally extending ridges and grooves alternating in transverse direction of the band, each ridge on one surface being backed by a complementary groove on the other surface, and each ridge on said other surface being backed by a complementary groove on said one surface, and wherein the bottom of the said grooves is a curved line.

4. A strapping device as defined in claim 3, wherein the ridges on one of said surfaces have crests located in a first plane and the ridges on the other of said surfaces have crests located in a second plane spaced from and parallel with said first plane, the distance between said planes being substantially greater than the distance between said major surfaces.

5. A strapping device as defined in claim 3 wherein said portions of said major surfaces are located in the respective grooves.

6. A strapping device as defined in claim 3, and further comprising reinforcing beads constituting portions of said band and located at the bottoms of said grooves extending longitudinally of the latter.

7. A strapping device as defined in claim 2, the spacing between said major surfaces being substantially constant at all points of said band.

8. A strapping device as defined in claim 1, wherein said synthetic plastic material is a resiliently yieldable material.

9. A strapping device as defined in claim 1, wherein said band has two oppositely directed major surfaces each provided with a plurality of longitudinally extending transversely alternating ridges and grooves respectively backed on the other surface by complementary grooves and ridges, the ridges on one of said surfaces having crests located in a first plane and the ridges on the other of said surfaces having crests located in a second plane parallel with said first plane and spaced therefrom by a predetermined distance.

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U.S. Cl. X.R.

264—210