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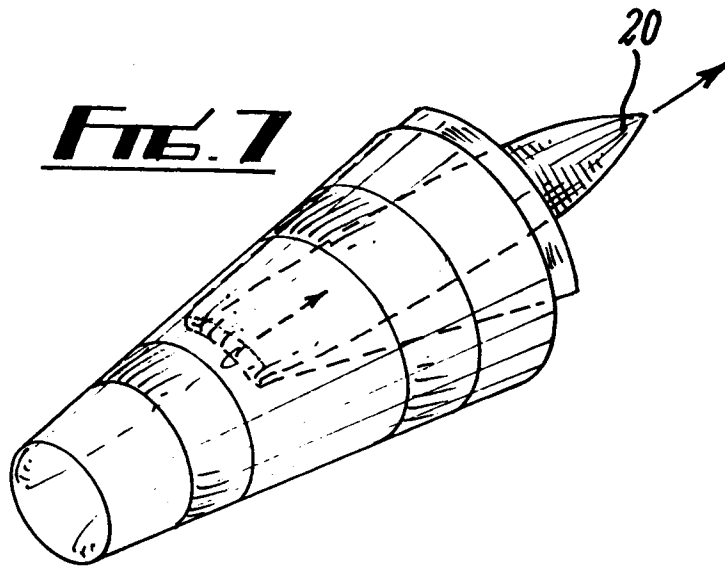
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54 **Preformed self adhesive sleeves for traffic control devices.**

57 A preformed sleeve (10) for fitting onto a body. The sleeve is coated with adhesive and the adhesive coating is covered by a release paper (12, 14, 16). An extension (20) of the release paper is provided which projects beyond the sleeve to assist removal of the release paper.



This invention relates to a method of manufacture and application of preformed self adhesive retro-reflective sleeves to fit three dimensional products such as, for example, road cones, traffic guidance delineators and the like.

5 Some of the difficulties in manufacturing, and particularly in the fitting of self adhesive preformed sleeves for, in particular, road cones, are explained in European Patent Application No.0405880 B1 (3M) and U.K. Patent Application No.2096214A (3M). These specifications also teach means by which such problems may be overcome by one means or another.

10 European Patent Application No.0405880 B1 refers to complex mechanical solutions whereby a non preformed die cut sheet is applied to a cone by wrap around method, and U.K. Patent Application No. UK 2096214 A utilises a similarly complex means of applying a retro-reflective tape by means of winding it around the cone or body in a spiral fashion. Thus, the solutions offered in these teachings do not allow for a means of application of a fully preformed self adhesive shape.

Neither of the two patents referred to disclose the application of a sleeve to a body other than in the course of manufacture in the factory.

15 It has recently been proposed that a cone sleeve may be made up as one piece, the inside surface of which is provided with a pressure sensitive adhesive. The sleeve may then be introduced and positioned on the cone satisfactorily in production. However, there is also a need to fit replacement sleeves onto cones or the like. In that case the pressure sensitive adhesive surface may need to be protected for example by means of a suitable release paper so that prior to introduction to a cone or other device the sleeve may be stored or transported without the adhesive surfaces becoming adhered together. This is especially beneficial where pre-used devices require renewal of the retro-reflective surfaces.

20 In practice it proves difficult to remove the release paper from the inside of the preformed sleeve, without the operative or their clothing etc., coming into contact with the exposed pressure sensitive adhesive surface. If the operative holds the preformed sleeve in one hand whilst attempting to strip out the release paper with the other hand the sleeve may collapse inwards or fold so that the pressure sensitive coated surfaces touch and stick together, rendering the sleeve useless. At best, removal of the release paper from within the sleeve is laborious, requires considerable patience and manual dexterity.

25 It was found that if the sleeve was provided with a single piece of release paper, the problem was further increased. In addition it was also found that the problem increased again where, in the case of a conical sleeve, the sleeve was constructed to extend substantially to the top of the cone, with consequently only a small aperture at one end, and in the case of a cylindrical device where the sleeve is constructed to be long and narrow, the removal of the release paper became very arduous if not for all practicable purposes, impossible.

These problems severely restrict the commercial exploitation of the release paper protected aspects of retro-reflective sleeves with an internal adhesive surface.

35 It was with these problems in mind that the present invention was made.

According to the invention there is provided a preformed conical, cylindrical or other sleeve that may be fitted onto a three dimensional shaped body, said preformed sleeve having its internal surface area at least partially coated with an adhesive, wherein said adhesive coating is covered by one or more pieces of release paper sufficient to prevent part of the adhesive surface contacting any other part during storage or transport, said release paper being provided with an extension beyond the adhesive coating said extension facilitating the removal of the said release paper by enabling an operator to grasp the extension or the like and pull the release paper through the internal opening of the sleeve.

40 The adhesive is preferably a pressure sensitive adhesive, but other adhesives which need protective covering can be used. The extension may be of the same material as the release paper or of different material. In the latter case the extension may be joined to the release paper by adhesive or other suitable means. The release paper can be provided with more than one extension if desired. In one embodiment of the invention the release paper pieces are applied to the adhesive coating prior to the sleeve being formed from a flat sheet of material. Alternatively the release paper can be applied to the adhesive coating after the sleeve is formed.

45 This invention finds particular use in combination with a method of applying sleeves onto a support body, said method comprising the provision of a liquid layer between the adhesive on the sleeve and the surface of the body and/or sleeve so as to permit the sleeve to be moved relative to the support body and thereafter securing said sleeve to the body with the adhesive.

50 In order to obtain a really good close fit between the preformed sleeve and the support body, the preformed sleeve should be no larger than the body on which it is to be fitted and preferably somewhat smaller than the body, for example by as much as 10%, but typically such that the internal dimension of the sleeve is from 1/16 to 1/8 inch smaller than the corresponding dimension of the support body. The preformed sleeve may need to be stretched in order to get it into position on the body. The preformed sleeve may also be warmed to assist fitting onto the support body. Generally the temperature to which the sleeve is heated will be above ambient

working levels. The degree of flexibility, stretch and suppleness will depend on the polymers selected for the construction of the sleeves, but temperatures exceeding 40°C and even 60°C or 80°C have been found beneficial for polyvinyl chloride based sleeves.

5 The liquid layer primarily has only a temporary role that is to permit the movement of the sleeve relative to the body. The liquid can be water or any other liquid which does not react with the adhesive, but acts mechanically to provide a physical barrier between the adhesive and the surface of the sleeve and/or cone to which the adhesive is to adhere. When the sleeve is in its desired position the barrier is broken down, for example by the application of pressure to the sleeve so that the adhesive secures the sleeve to the body.

10 The liquid may have a further role in that it can have an effect in the adhesion process, for example by triggering a cross-linking reaction.

The liquid may be one which, while permitting movement of the sleeve relative to the body, also has a, possibly time dependent, action on the adhesive. For example the liquid may be a solvent for the adhesive, the solvent characteristics of which are only manifest for a limited period of time, or the liquid may be one which, after a limited period of time, acts directly on the adhesive to promote curing thereof.

15 A plurality of apertures may be provided in the preformed sleeve and/or the body, an excess of adhesive or adhesive solvent being applied to the sleeve and/or to the body whereby said excess adhesive or adhesive solvent permits the sleeve to be moved relative to the body into a predetermined position whereupon excess adhesive or adhesive solvent escapes or can be extruded through the said apertures in the film.

20 The sleeve is immersed in a container of, or is sprayed with, a suitable liquid such as water or a solution of water containing a wetting agent so that when the preformed sleeve is introduced over the top of the body and moved into its desired final position, the liquid film present at the surface interface between the body and the sleeve prevents the adhesive from "grabbing" until the desired positioning is achieved.

25 It was found that whilst the liquid film is present, sleeve positioning could be easily and quickly achieved and that by "smoothing" out any excess liquid from the centre of the sleeve to the edges, the aggressive nature of the pressure sensitive adhesive progressively overcame the interference by the liquid, encouraging remaining liquid to migrate to the edges until a bond was achieved over substantial areas of the available interface between the body and the preformed sleeve. Any remaining liquid evaporates or migrates over a period of time. If some coalesced areas of liquid remain it does not significantly reduce the overall effect or practical result. The inclusion of small holes in the preformed sleeve material can help this process.

30 As already mentioned the liquid may be water or any other liquid which will permit movement of the sleeve relative to the body.

Using the invention it has been found that it is possible also to introduce close fitting pressure sensitive adhesive coated preformed sleeves on to complementary shaped bodies including cones and cylinders. Indeed, if the material which the sleeve is made from is elastic to some degree, the sleeve may even be introduced over a body of larger dimension than the unstretched sleeve dimension without damage. This enables the sleeve to be moved to a final position where there is an undercut or smaller dimension section designed to receive the sleeve.

40 In the same way a sleeve can be fitted to a cone where the sleeve which has a diameter at its top opening which is smaller than the diameter of a cross section made through the cone profile immediately above the upper portion where the said band will finally remain. This technique is not limited to cones and can be used with bodies of other shape such as oval or ovoid shaped body or a cylinder or even a large drum or barrel.

This invention is particularly beneficial where a body such as an old cone needs to have a "new" surface applied to it at a site remote from the point of cone or sleeve manufacture.

45 Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings in which:-

- Fig.1 is a side view of a preformed sleeve for a road cone;
- Fig.2 shows diagrammatically certain dimensions of pieces of release paper for covering the internal surface of the sleeve of Fig.1;
- Fig.3 shows some further dimensions of the pieces of release paper of Fig.2;
- 50 Fig.4 illustrates how the release paper pieces are fitted inside the sleeve of Fig.1;
- Fig.5 shows the sleeve of Fig.1 after the release paper pieces have been fitted;
- Figs.6 & 7 illustrate two stages in the removal of the release paper from the sleeve of Fig.1; and
- Fig.8 illustrates the application of the invention to a sleeve for a cylinder.

55 Referring to the drawings a retro-reflective conically shaped sleeve 10 as illustrated in Fig.1 was made by first cutting the material to shape and welding the two ends together to make the final shape. The resulting sleeve was then sprayed internally with a pressure sensitive adhesive emulsion and the adhesive was allowed to dry and develop its properties fully.

Three pieces of release paper 12, 14, 16 were die cut to a roughly triangular shape so that they tapered,

each to conform to a projected plan area of the inside of the cone sleeve slightly larger than that which subtends an angle of 120° (Fig.2). These pieces of release paper were also made longer than the length of the sleeve, by extending both beyond the wider end as at 18 by for example 10mm and the narrow end as at 20 to a point (Fig.3).

5 The three pieces of release paper were then temporarily attached to a conically shaped mandrel 21 by small pieces of self adhesive tape 22, so that their edges overlapped to provide a continuous area of release paper surface (Fig.4). The previously prepared precoated fully adhesive sleeve 10 was then placed over the release paper covered mandrel, so that the release paper adhered to the inside surface of the sleeve.

10 After smoothing the sleeve 10 into position, the self adhesive tape 22 used for temporary location of the release papers was removed and the cone sleeve was taken off the mandrel with the release papers transferred to their correct location inside the sleeve. The sleeve can then be folded flat and placed in a box for transport and later use. It will be noted that the triangular points of the release paper extended beyond the narrow opening in the top of the sleeve (Fig.5).

15 After removal of the sleeve from storage the operator has a simple task of folding the exposed and protruding triangular flaps projecting from the narrow open end of the sleeve, such that the ends return through the open hole (Fig.6). The then represented ends of the triangles are grasped separately or together and pulled back through the inside of the cone sleeve form (Fig.7). This is easily accomplished, in a controlled manner even by an inexperienced person. The sleeve may then be fitted to a cone body. It is to be understood that the assembly can be constructed such that the release paper pieces can only be removed separately, can only
20 be removed together or can be optionally removed separately or together.

The above described specific embodiment uses three pieces of release paper. While this was found particularly useful, the principle of providing one or more extensions to the release paper such that it can be returned inside the cone sleeve to facilitate removal works with a single piece or more than one piece of release paper and thus, a single piece suitably formed is within the scope of the present invention.

25 The use of small pieces of adhesive tape is not the only way to position the release papers on the mandrel. Other means such as vacuum can also be used as will be readily understood by those familiar with such art.

The extensions of the pieces of release paper to a triangular point can have any shape and may be of another material, possibly stronger than the release paper. Such an extension might take the form of a string, ribbon, tape or strip or other means which can perform substantially in the same function.

30 The provision of an extension of the release paper which extends from either or both of the top and bottom opening of the preformed sleeve is not essential and other forms of extension for removal of the release paper can be used. For example a pull point can be provided at a corner or edge of a precisely fitting release paper, or a piece of the release paper within the sleeve may overlap another piece of release paper, the overlap acting as an extension by which the release paper can be removed.

35 The release paper does not have to extend at both ends, but needs to be of sufficient area to substantially cover the adhesively coated inner surface of the sleeve to prevent adhesion of the internal surfaces of the sleeve during storage. Thus, in one embodiment, a single sheet of release paper extending over an arc of 180° or more of the inside surface of the sleeve would suffice to keep the adhesive covered surfaces apart if the single piece of release paper is provided with a means of facilitating removal as above.

40 In another embodiment illustrated in Fig.8, for application to cylindrical sleeves to be fitted to delineators of the cylindrical type, the triangular shaped pieces of release paper utilised above are substituted by rectangular shapes, again with extension pieces attached to one end, but in this case, the extension pieces 24 being sufficiently long to pass far enough back down the tubular sleeve to be reached by the operative for removal. In the case where these sleeves are narrower than the average hand, the strips should pass right through the
45 sleeve from one end to the other to be visible and easily graspable.

By employing this feature as described with reference to Fig.8 and by selecting suitable high slip release papers, it is possible to introduce a sleeve over a cylinder with the sleeve having its release papers still in place. Providing that the sleeve or the body to which it is being fitted is sufficiently resilient or elastic, the release papers may then be stripped out by pulling on the extension pieces provided; leaving the sleeve correctly
50 placed and adhered to the product body.

It has been found that this procedure was aided if the release papers were accurately cut so that they abutted edge to edge, and did not overlap, an option open in some circumstances also for conical shaped sleeves, although final position of a cone sleeve remains difficult for the operator to achieve.

55 When correctly designed by those skilled in the arts of graphics and presentation, the extensions of the release papers can be decorated or formed to enhance the products utilising this invention, or provide information to the operator seeking to use them.

Claims

- 5 1. A preformed conical cylindrical or other sleeve that may be fitted onto a three dimensional shaped body, said preformed sleeve having its internal surface area at least partially coated with an adhesive, wherein said adhesive coating is covered by one or more pieces of release paper sufficient to prevent part of the adhesive surface contacting any other part during storage or transport, said release paper being provided with an extension beyond the adhesive coating, said extension facilitating the removal of the said release paper by enabling an operator to grasp the extension or the like and pull the release paper through the internal opening of the sleeve.
- 10 2. A sleeve as claimed in Claim 1 wherein the extension is of the same material as the release paper.
3. A sleeve as claimed in Claim 1, wherein the extension is of different material to the release paper and is joined to the release paper by adhesive or other means.
- 15 4. A sleeve as claimed in any preceding claim wherein the release paper is provided with a plurality of extensions beyond the adhesively coated surface of the sleeve.
5. A sleeve as claimed in any preceding claim wherein the adhesive coating and the release papers are applied prior to joining the edges of a flat sheet of material to form the sleeve.
- 20 6. A sleeve as claimed in any preceding claim, wherein the adhesive layer and release papers are applied after the flat sheet of material has been joined at its edges to form a sleeve.
- 25 7. A sleeve as claimed in any preceding claim attached to a traffic guidance device for use on highways.
8. A sleeve as claimed in Claims 1 to 6 for use with devices associated with road, marine, rail or air transportation.
- 30 9. A sleeve as claimed in any preceding claim, wherein the sleeve is flexible.
10. A sleeve as claimed in any preceding claim, wherein the sleeve presents more than one colour.
11. A sleeve as claimed in any preceding claim, wherein the sleeve is comprised at least in part of retro-reflective materials.
- 35 12. A sleeve as claimed in any preceding claim, wherein the adhesive is a pressure sensitive adhesive or other adhesive requiring a protective cover.
- 40 13. A device with a retro-reflective surface which has been formed by fitting to a body, whether entirely of new material or refurbished, a sleeve as claimed in any preceding claim after removal from the sleeve of the release paper.
- 45 14. A device as claimed in Claim 13, wherein after removal from the sleeve of the release paper a liquid layer is provided between the adhesive on the sleeve and the surface of the body so as to permit the sleeve to be moved relative to the body prior to the sleeve being adhered to the body.
15. A device as claimed in Claim 13 or 14 wherein, the sleeve is flexible and/or elastic.
- 50 16. A device as claimed in any of Claims 13 to 15, wherein the sleeve is not larger than the body.
17. A device as claimed in Claim 16, wherein the cross-section of the sleeve is up to 10% smaller than the cross-section of the body.

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