March 3, 1953 Y. Z. VON STACKELBERG ET AL 2,629,953

PLASTIC IDENTIFICATION SLEEVE

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Fig. 1.

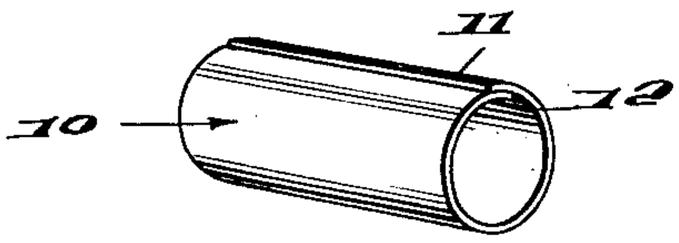

Fig. 2.

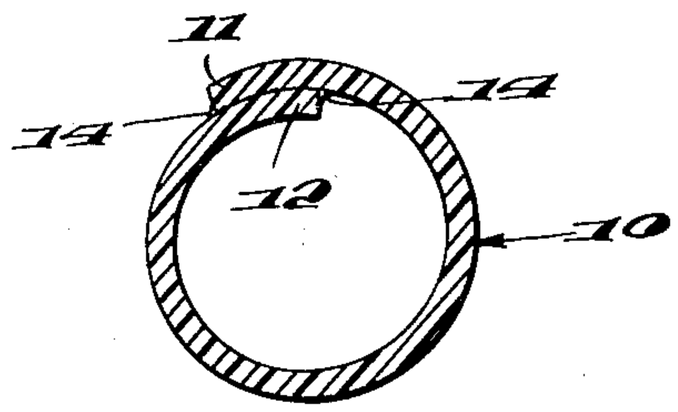

Fig. 5.

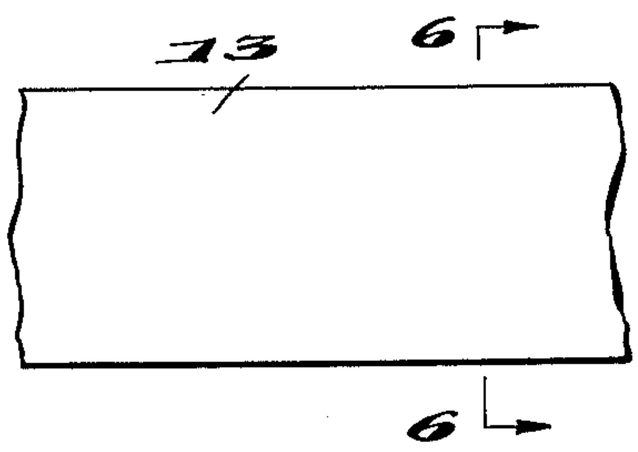

Fig. 3.

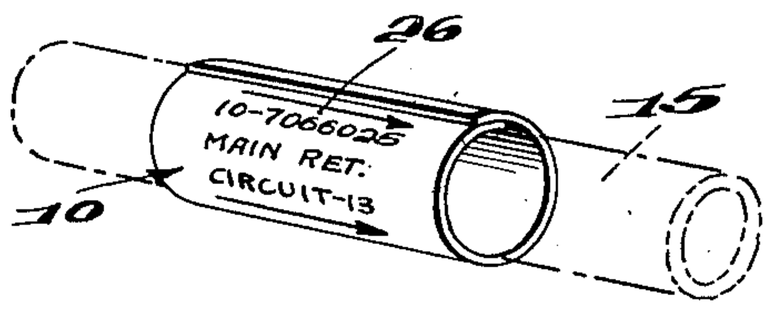

Fig. 6.

Fig. 7.

Fig. 9.

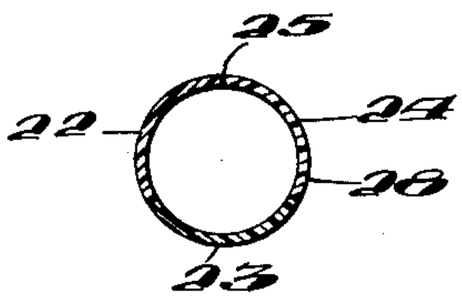

Fig. 4.

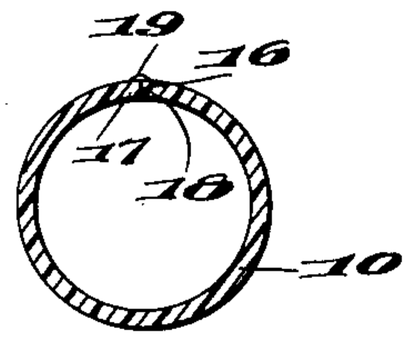

Fig. 8.

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PLASTIC IDENTIFICATION SLEEVE

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1 Claim. (Cl. 40—21)

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Our invention relates to identification means and, more particularly, a plastic identification sleeve adapted for bonded encirclement of an object and a method of identifying tubing.

Positive identification of each tube and cable forming integral parts of a complicated mechanism has become practically indispensable. For example, in a ship or aircraft, it is highly desirable to be able to quickly trace fuel, oil, water and fire extinguisher lines. This is especially true where these and other tubes and pipes converge for passage through a bulkhead or a like area restricted as to space. In view of the fact that the areas through which these lines pass are often contaminated with chemical vapors, moisture, oil and other like substances which have the tendency to adversely affect ordinary materials, a marking must be unusually rugged to withstand such adverse operating conditions.

Heretofore, it has been customary to provide markings formed of cellophane strips adhesively attached to the tubing of such an installation. A standard color code or system of markings has been established which makes each tube or article so marked readily identifiable for servicing or repair as long as the color combination remains attached thereto and discernible. However, it has been found that markings so attached by adhesive are quickly affected by the diluent effect of the aforedescribed foreign substances to which the markings are subjected. The result is that the adhesive is soon ineffective so as to allow the marking to become loose and thereafter become lost. Loss of a marking from such equipment creates a severe service problem for it is very difficult for anyone to trace the line involved, causing considerable lost time in the servicing of equipment, as well as the danger of a severe accident in case of mistaken identity between tubes carrying different materials at different pressures.

The present invention provides an identification sleeve or band for bonded installation around an article characterized by being formed of plastic material in which strips of different colors are moulded into a unitary structure and formed as an inexpensive ring, including a method of application.

It is therefore one of the principal objects of this invention to provide an improved identification sleeve for colored marking of various articles.

Another object is to provide an identification sleeve highly resistant to adverse service conditions.

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Still another object is to provide a multi-colored identification sleeve that can be readily installed around a circular object as a manufacturing or maintenance operation.

Another object is to provide an inexpensive marking for tubing capable of reuse or quick replacement.

A still further object is to provide an inexpensive method of marking tubular articles with an encircling plastic sleeve capable of being formed in a plurality of colors with a printed indicia imposed thereon.

Another object of this invention will become apparent from the following description, when taken in conjunction with the accompanying drawing, in which like numbers refer to like parts in different views.

In the drawings:

Figure 1 is a perspective view of the plastic sleeve of this invention.

Figure 2 is an enlarged cross-sectional view showing the ends of the sleeve overlapped.

Figure 3 is a perspective view of the sleeve in its preferred embodiment installed on a tubular member.

Figure 4 is a cross-sectional view of the sleeve of this invention formed with butted ends.

Figure 5 is a plan view of a fragment of the sleeve material prior to forming.

Fig. 6 is a cross-sectional view of the sleeve material taken on line 6—6 of Figure 5.

Figure 7 is a cross-section of a multi-colored sleeve formed with two different color sections.

Figure 8 is a cross-section of a multi-colored sleeve material formed with three different color sections.

Figure 9 is a cross-section of a sleeve material, prior to cutting and flattening, showing the integral arrangement of the colored sections.

Referring particularly to Figure 1, the identification sleeve 10 of this invention is illustrated in its formed condition. The sleeve 10 is formed from plastic material of a predetermined thickness and to the desired width. Width of the sleeve, of course, is mainly determined by the amount and size of indicia to be printed thereon, if any. In marking the tubing of aircraft used by the government, a certain color code has been established and it has been found that a sleeve width of one inch provides sufficient area for printing the part number, a flow direction indicia and the component part served on a sleeve so coded. The material from which the sleeve 10 is formed is preferably of extruded strip 13 material (Figure 5) cut into sections of sufficient

length to encircle the tube to be marked with the ends thereof brought into overlapped or butted juncture as found most suitable for the application of the marking.

We have found that plastic material formed of cellulose acetate butyrate, extruded to a thickness of substantially .025 of an inch, will provide a satisfactory marking sleeve applied either with a lap joint or a butt joint (Figure 4). The question of which form of joint to use depends greatly on matters of appearance, smoothness of surface to be attained and service requirements. It is to be understood, of course, that an overlapped joint readily lends itself to slight variations in outside tube dimensions and inspection procedures and, therefore, is to be preferred where conditions permit.

In forming the overlapped sleeve **10** shown in Figures 1, 2 and 3, strip **13** is cut to sufficient length to provide for forming of the sleeve to a predetermined diameter with the ends allowed to overlap as shown with the outer end **11** positioned on top of the inner end **12**. An overlap of substantially ¼ of an inch has been found to provide sufficient juncture area for the establishment of a permanent bond between the ends **11** and **12** when a suitable bonding medium is used. Preforming of the material to a generally circular form is readily accomplished by the use of a forming machine of the type disclosed in the co-pending application of Fritz Albrecht et al., bearing Serial #93,154, for a plastic identification sleeve forming machine wherein a suitable cutting means is positioned adjacent movable dies arranged to shape or form a section of hot plastic material.

The ends of sleeve **10** are bonded together to form a closed ring (Figure 2) around a tube **15** to be identified with suitable indicia, as best illustrated in Figure 3. The ends **11** and **12** are sealed or bonded together by the insertion of a sufficient amount of solvent such as acetone to dissolve the plastic sleeve material sufficiently to form a welded joint therebetween, as shown by fillet **14**, extending along the edges of the bond area.

It is obvious that an overlapped welded joint, as shown in Figure 2, will provide the greatest strength and has been found desirable on those installations subjected to extreme service conditions such as in the nacelle of an aircraft. A plastic sleeve so formed and installed is practically indestructible, short of fire. In those instances where a tighter encirclement of the tube is desired, a sleeve **10** formed with a butt-welded joint **16**, as shown in Figure 4, has been found satisfactory. In this type of installation the abutted ends **17** and **18** are butt-welded or bonded together by the insertion of sufficient solvent to dissolve the engaging surfaces of the ends to form a bonded juncture line **19** that extends the entire length of the joint so formed.

It is of great importance in this form of identification where obliteration of identity is to be guarded against that colors extend clear through the plastic sleeve material. This problem is not serious in providing sleeves of one solid color from the strip **13**, as shown by Figures 5 and 6. In this form the strip **13** is simply extruded from plastic material dyed to the desired color. However, in the forming of multi-colored sleeves, it is not only important that the colors extend entirely through the material but that the different color areas be distinct and uniformly proportioned as illustrated by the strip materials of

Figures 7 and 8. The best results have been attained by having such multi-colored material extruded as separate colors bonded together to form a tube having an outside circumference of substantially one inch and then converting the tube into flat material for forming into sleeves having circumferential color stripes. Figure 7 illustrates a strip of plastic material formed of two different color sections **20** and **21** of equal width joined at demarcation line **27**. And in Figure 8 is illustrated a strip of the same width material formed with three separate color sections **22**, **23** and **24**, such as blue—yellow—blue, which constitutes one of the commonly used code designations for a hydraulic line of an aircraft. In forming such material as a tube, conventional type extruding equipment is used, which produces different colored plastic materials joined together at aligned juncture points, so as to form a unitary structure. In this manner, colored stripes running longitudinally of the tube of uniform widths with color extending clear through the material from the interior surface to the exterior surface are readily produced. Furthermore, the proportionate width of the respective stripes relative to each other may be conveniently varied by a change in the width of each color extrusion. This possibility of change in the width of color stripes is taken advantage of to attain a flat strip of material having one color stripe centered between outside color stripes of equal width formed from tubular material as hereinafter explained.

In order to convert the material from its circular form as an extruded tube having color stripes running lengthwise thereof into a flat strip suitable for receiving printed indicia thereon and forming into sleeves, the extruded tube is cut on a line longitudinally thereof as shown by the cut line **25** of Figure 9. The cut line **25** is positioned at a point diametrically opposite color section **23** so as to cut the tube lengthwise and form equal sections **22** and **24** from the larger color area thereby halved. The tube material is then flattened to provide a flat plastic strip, as shown by Figure 8, having an outside color section **22**, a middle color section **23** and a second outside color section **24** of the same color as section **22**, all equal in width. When produced in this manner, the flat sleeve material is characterized by having integrally formed colored stripes of uniform widths that extend from the outside surface of the sleeve material to the inside surface thereof. Such an arrangement of the colored stripes assures the permanency of their identification as there can be no loss of color due to wear until the material is worn clear through to the inner surface.

Figure 3 illustrates the use of a sleeve **10** on a tube **15** of a fluid line where the sleeve is provided with a complete indicia **26** printed thereon. The thermo-plastic characteristics of the sleeve material are utilized to effect a relatively deep imprinting of such indicia below the outer surface of the material so as to be unaffected by surface abrasion.

Our method of identifying tubes in accordance with this invention is as follows:

The plastic sleeve material is formed as a flat strip in the color or color combination desired, printed with the desired indicia, cut and formed generally circular of sufficient length to allow for overlapping of ends **11** and **12** when placed around the tubular structure **15** where an overlapped joint is desired. A sufficient amount of

solvent is inserted between the ends 11 and 12 to dissolve the surfaces thereof, after which the ends are clamped together and held in engagement for sufficient length of time to allow for the solvent to evaporate, allowing the ends to become welded together, after which the clamping pressure is removed. In certain instances, such as where a number of sleeves are being applied in sequence, it has been found desirable to first clamp the sleeve ends 11 and 12 in place and then insert the solvent directly into the juncture area formed thereby with a hypodermic needle equipped syringe. In this manner, a more accurate control of the amount of solvent used and the time required for clamping is attained. The same procedure is followed in the forming of a butted joint, as illustrated by Figure 4, except that the strip is cut just sufficiently long to circumscribe the tube to be identified with butt edges 17 and 18 brought into firm engagement.

We have found that to join the ends of the sleeve to form a unitary ring round the tube not only makes the sleeve impossible of removal, short of destruction, but with its inner periphery left free of adhesive also allows for sliding movement relative to the tube surface for alignment, relocation for greater convenience, or reinsertion over a tube made up as a service operation, as may be desired or found necessary. However, it is to be recognized that in certain instances where permanency is not of primary importance, our sleeve could be adhesively attached to a tube by means of a suitable adhesive.

Other modifications and adaptations of the identifying sleeve of this invention and the method of identifying tubular articles will occur to those skilled in the art and we choose, therefore, not to be limited to the specific forms, herein delineated and ascribed, but rather to the scope of the claim.

We claim:

A conduit identification device comprising a

solvent-softenable thermoplastic generally tubular hollow convolute sleeve; said sleeve being of unitary one piece construction, and characterized further by being composed of a plurality of differently colored circumferential color bands located adjacently one after the other in axial arrangement throughout the sleeve length; said sleeve being color-saturated in each band so that each is uniformly colored in all its length and thickness; said sleeve being formed entirely from a multi-colored extruded body of substantially uniform characteristics.

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