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Weichenrieder

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[54] **HOLLOW PLASTIC BREAK-AWAY POST**

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Aug. 27, 1970 Germany.......................... 2042640

[52] **U.S. Cl.** **52/98,** 404/10

[51] **Int. Cl.** **E01f 13/00**

[58] **Field of Search** 256/13.1; 52/720, 98, 727, 52/738, 739, 298, 296; 94/1.5; 404/10

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[57] **ABSTRACT**

A hollow plastic break-away post for street markers and the like, where an extruded plastic shaft with integrally extruded interior stiffening members are butt-welded to a post base which includes several locking noses on its cylindrical anchoring portion. The post base fits into a fixed anchoring socket and is lockable therein in a bayonet-type lock, the base being capable of yielding elastically to permit the locking noses to snap loose for a damage-free break-away of the post under impact. The locking noses of the base are reinforced and protected against wear by metallic nose inserts which are imbedded in the plastic material.

The fabrication method of the post involves extrusion of the interior stiffening members of the shaft in a cross-sectionally curved shape to allow for the solidification shrinkage of these members to take place without distorting the already solidified profile shell.

4 Claims, 17 Drawing Figures

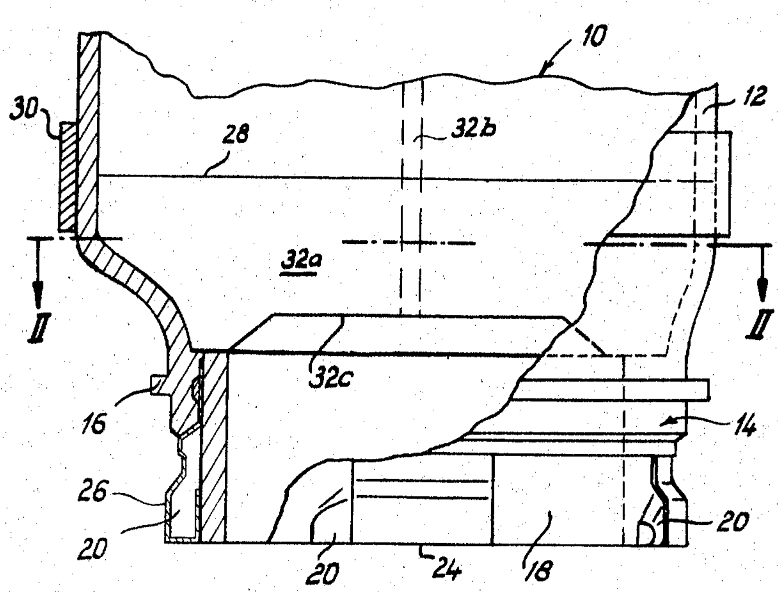
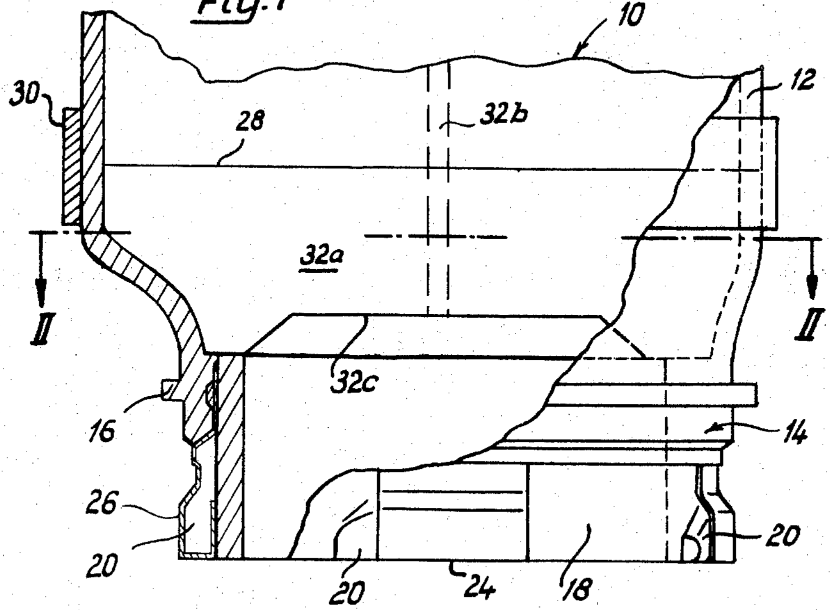


Fig. 1



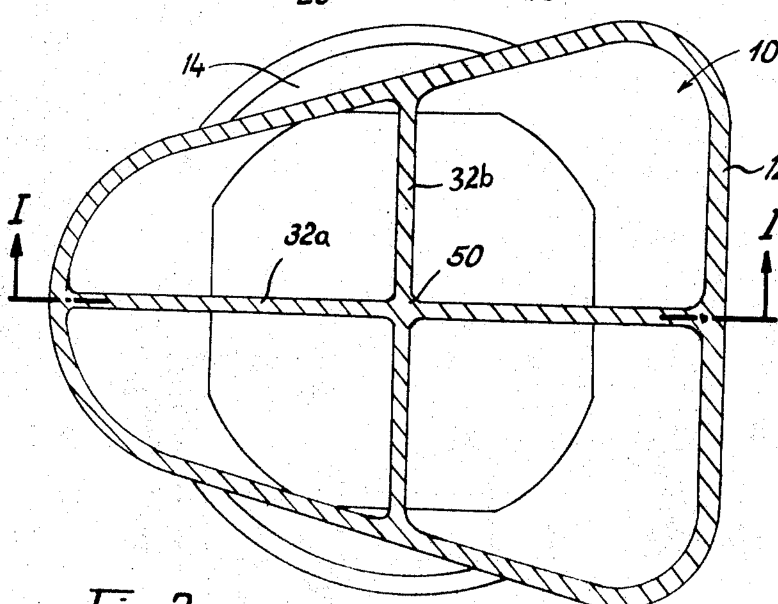


Fig. 2

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Fig. 3a

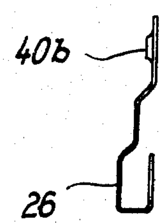
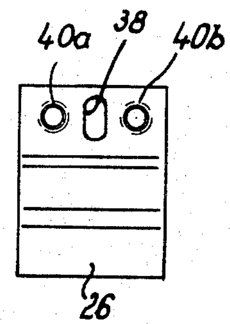


Fig. 3b



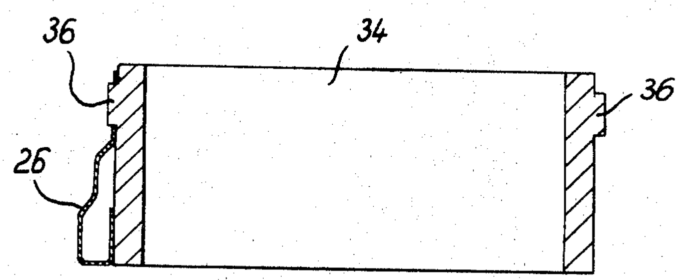


Fig. 4

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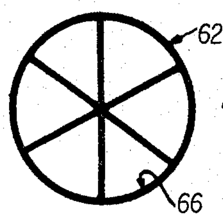
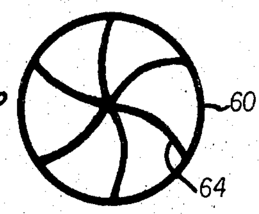


Fig.5a

Fig.5b



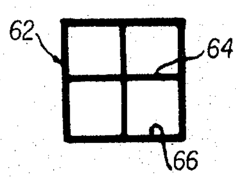
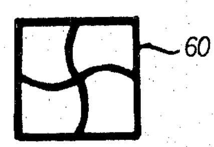


Fig.6a

Fig.6b



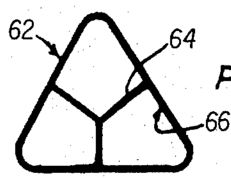
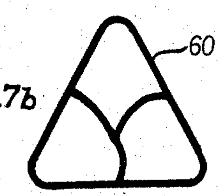


Fig.7a

Fig.7b



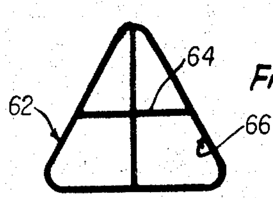
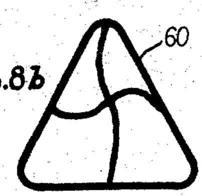


Fig.8a

Fig.8b



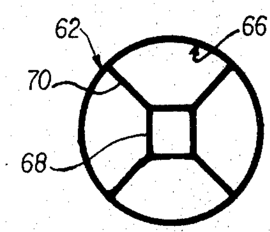
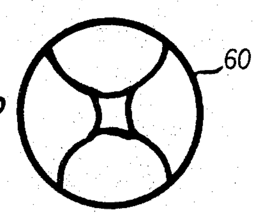


Fig.9a

Fig.9b



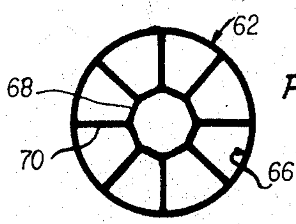
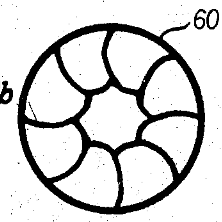


Fig.10a

Fig.10b



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HOLLOW PLASTIC BREAK-AWAY POST

BACKGROUND OF THE INVENTION

1. Field of the Invention

The invention relates to hollow plastic break-away posts and a method for their fabrication, and in particular to hollow plastic break-away street guideposts whose shaft has a closed shell with integral interior reinforcing ribs, and which have an anchoring base by which the post can be locked into an anchoring socket in the ground in a bayonet-type lock which releases the post under a strong impact.

2. Description of the Prior Art

From the prior art are known street guideposts of this general type, where the connection between the guide post base and the anchoring socket is so arranged that the post can be forced out of its anchoring socket, when it is subjected to a substantially horizontal fontal force, such as would occur, for example, when a vehicle hits the post. Under such an impact, the post should break away from the anchoring socket without being damaged, so that it can later be reinserted into its socket. On the other hand, however, the lock between the post and its anchoring socket must be strong enough to withstand such strain as can be caused by snow pressure during snow removal operations, for example, without breaking away from its socket under the strain. This feature is important because it is essential that during wintertime the marking of streets and highways remains intact to indicate their outline.

In view of the fact that such a firm lock is required between the post and the socket, the post must have a high resistance against bending and denting, to avoid kinking of the post under an impact force before the latter is high enough to cause the post to break away from its socket. To try to obtain such a bending and denting resistance by increasing the wall thickness of the post would involve a concommittant increase in the weight and in the moment of inertia of the post with the risk that an impacting vehicle could suffer considerable damage. This risk of damage was the very reason why the previously widely used wooden or concrete guideposts were replaced by the much lighter plastic guideposts.

SUMMARY OF THE INVENTION

It is an objective of the present invention to provide a plastic break-away guidepost which is sufficiently resistant against bending and denting, in order to withstand the horizontal break-away impact force without kinking, and to transmit to the post base and anchoring socket the bending moment at which the post base will be released from its lock in the socket, while at the same time being of minimal mass, so as to avoid damage to the vehicle causing the impact force. In addition, the guidepost should be sufficiently elastic to absorb the impact shock without breaking apart.

The invention proposes to attain the above objective by suggesting a plastic break-away guidepost which includes a hollow shell with interior stiffening ribs which extend from sidewall to sidewall across the interior of the shell along the shortest possible lines, whereby the ribs are extruded integrally with the shell wall. A preferred embodiment of the invention suggests an arrangement where a plurality of ribs extend inwardly from the outer shell to a second, interior member in the form of a coaxial tubular profile.

As was mentioned previously, the post must have a certain degree of elasticity, which is obtainable by fabricating it from a polyethylene plastic, preferably a polyethylene plastic which is relatively soft. This material has the disadvantage, however, that it wears relatively quickly under the mechanical strain and friction occurring during break-away of the post base from its socket. Thus, when the lock between the base and the socket is of the bayonet-type, where cam-shaped noses on the base engage matching protrusions in the socket, repeated forcible break-away actions would wear off these noses quickly, thereby severely limiting the longevity of the post. In a further development, the invention therefore suggests that these hollow plastic guideposts which are to be locked into their anchoring socket by means of a bayonet-type lock, and which therefor have a substantially cylindrical base with cam-shaped noses, preferably include metallic reinforcement inserts for these noses, thus improving the stability of the lock. A further preferred feature suggested by the invention is an arrangement, whereby these metallic nose inserts are imbedded in the wall material of the post base in an area outside the noses themselves.

A further advantageous result follows from the additional suggestion that the metallic reinforcement inserts cover the outside of the noses on at least their outer periphery and on their upper and lower end faces. This feature greatly improves the wear resistance of the locking noses, giving the guidepost a longer useful life.

The fabrication of plastic posts having interior stiffening ribs integrally extruded with the shell wall has in the past been fraught with unsurmountable problems, as will be explained in detail below:

To obtain the continuous hollow plastic profile necessary for this type of post, one has to resort to the hot-extrusion process. In the case of extrusion of polyethylene, however, a twofold problem results from the poor heat conductivity of this material, on the one hand, and from the considerable shrinkage of the material during solidification, on the other hand. Polyethylene may shrink between 4 and 5 percent, while the more quickly cooling polyvinyl chloride, for example, shrinks by about 1 percent only. Employing specially developed devices, it has become possible to extrude polyethylene in the form of hollow profiles, by cooling the outer surface of the hollow profile, and by simultaneously calibrating it during solidification, using, for example, a partial vacuum around the outer surface to hold the profile in position.

Thus, the extrusion technology known heretofore, while suggesting a way of cooling and solidifying the outside of a hollow profile, offered no solution for producing by extrusion a profile such as is suggested by the invention. It was considered impossible heretofore, to produce a profile with the interior reinforcing ribs as desired, because cooling and solidification of the ribs would take place at a slow rate and continue for quite some time after the outer shell itself had solidified. Shrinkage of the later solidifying ribs would cause the latter to forcibly contract, thereby creating high tension stresses, cracks, and undesirable distortions in the outer shell of the profile.

With materials having a high rate of shrinkage, such as polyethylene, for instance, the problem just described becomes particularly acute. Yet polyethylene is the most suitable material for applications like break-away street guide posts, traffic signposts and the like, because it offers a high resistance against bending and denting.

It is conceivable that one might attempt to circumvent the above problems in fabricating the desired cross-sectional profile, by producing the inner elements of the profile separately from the outer shell and by later inserting the former into the latter. It is easily demonstrated, however, that the resistance to bending and kinking is many times higher in the case where the reinforcing ribs are extruded integrally with the shell, because of the capability of the integral ribs to transmit tension forces from one wall portion to an opposite wall portion. Thus, the combination of a minimum profile weight with a maximum resistance against bending and kinking is only then present, when the desired hollow profile is extruded integrally as a single piece, whereby the integral stiffening ribs have to be so arranged that, under a bending load, they transmit tension stresses from one side of the outer shell to the opposite side thereof.

The above-described extrusion problem is solved in a still further development of the invention which suggests a method of producing the hollow profile of the invention, wherein the profile is obtained by hot-extrusion, the shape of the interior elements of the profile in the hot, extruded stage being such that their lineal cross-sectional lengths allow for shrinkage of the interior elements without creating objectionable stresses and distortions in the earlier solidified and calibrated outer shell of the profile.

Another advantageous feature follows from the further suggestion that, where the extrusion profile includes an inner coaxial hollow profile, the latter be likewise extruded with an excess cross-sectional contour length which would compensate for the shrinkage occurring during solidification.

A further difficulty that has to be overcome in the fabrication of the plastic break-away post of the invention is related to the incorporation of the metallic nose inserts. Because of the large difference in the heat expansion coefficients between steel and polyethylene, it is not possible to combine the several nose inserts into a single steel ring which would perhaps be slipped over the post base. Thus, it is necessary to provide an independent metallic insert for each of the cam noses which are arranged around the circumference of the base. As these metal inserts are preferably made of a high-strength steel alloy, such as V2A-steel, for example, it is also not possible to magnetically position them in a mold, so that a different approach for their incorporation becomes necessary, to assure the required accurate positioning of the cam noses relative to the body of the base. A still further objective of the present invention is therefore to provide a novel method of incorporating and accurately positioning the metallic inserts for the cam noses.

To attain the above objective, the invention further suggests that the metallic inserts be mechanically attached to the outer periphery of an annular base core of plastic on which the inserts take their final accurate diametral and angular positions. At this stage, the hook-shaped wrap-around portions of the inserts, which are to protect the noses of the base, protrude radially from the base core, with the noses themselves still missing. This base core, with the inserts attached to it, is then placed into an injection mold where, in an injection molding operation, the remainder of the post base is formed around the base core. In this molding operation, the space enclosed by the nose inserts is filled in, and a cam-shaped nose is formed around each nose insert. The upper portion of the post base has a widening transition portion and a cross-sectional end profile which corresponds to that of the extrusion which is to form the post shaft, thus permitting joining of the two post sections in a butt-welding operation.

A preferred structural feature in connection with the above-described positioning of the metallic nose inserts suggests that each insert be provided with a positioning hole which engages a matching positioning ear on the base core.

A still further preferred feature suggests the provision of a reinforcing ring covering the seam by which the post base is joined, the post shaft, the ring, too, being secured by welding.

BRIEF DESCRIPTION OF THE DRAWINGS

Further special features and advantages of the invention will become apparent from the description following below, when taken together with the accompanying drawings which illustrate, by way of examples, preferred embodiments of the invention, represented in the various figures as follows:

FIG. **1** shows, in an elevational view, with a partial center cross-section along the line I—I of FIG. **2**, the lower portion of a street guidepost embodying the invention;

FIG. **2** shows, in a cross-section taken along the line II—II of FIG. **1**, details of the post base of FIG. **1**;

FIG. **3***a* shows, in a side elevation, a metallic nose insert for the post base;

FIG. **3***b* shows the insert of FIG. **3***a* in a front view;

FIG. **4** shows a center cross-section of the annular core of the post base of FIG. **1**, a metallic nose insert being shown attached thereto;

FIG. **5***a* shows a cylindrical cross-sectional post profile after solidification and calibration;

FIG. **5***b* shows the profile of FIG. **5***a* immediately following its extrusion;

FIG. **6***a* shows a square cross-sectional post profile after solidification and calibration;

FIG. **6***b* shows the profile of FIG. **6**a immediately following its extrusion;

FIG. **7***a* shows a cross-section of a guidepost profile after solidification and calibration;

FIG. **7***b* shows the profile of FIG. **7**a immediately following its extrusion;

FIG. **8***a* shows a cross-section of a guidepost profile similar to that of FIG. **7***a;*

FIG. **8***b* shows the profile of FIG. **8**a immediately following its extrusion;

FIG. **9***a* shows a cross-section of a cylindrical extrusion profile with an inner coaxial tube, after solidification and calibration;

FIG. **9***b* shows the profile of FIG. **9***a* immediately following its extrusion;

FIG. **10***a* shows a cross-section of a cylindrical extrusion profile similar to that of FIG. **9***a*, after solidification and calibration; and

FIG. **10***b* shows the profile of FIG. **10***a* immediately following its extrusion.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

The break-away street guidepost **10**, of which only the lower portion is shown in FIGS. **1** and **2**, includes a shaft **12** having a cross-section in the general outline of a triangle with rounded-off corners, and a generally cylindrical post base **14**. At a distance from its lower end **24** the base **14** includes a shoulder **16** in the form of a continuous peripheral rim, while the lower end portion **18** of the base has a diameter smaller than that of the shoulder **16**. On its periphery, the base **14** includes several radially protruding cam-shaped noses **20**.

This post base **14** is so designed that it can be inserted into a known anchoring socket (not shown) which has the form of a pot with a flat end face around its open upper end, the latter being arranged to support the shoulder **16** of the base. On its inner wall, the socket includes several inwardly protruding cam portions which can be engaged from below by the cam noses **20** of the post base **14**, thereby firmly locking the guidepost to the anchoring socket. In assembled condition, the post base **14** and the anchoring socket preferably leave an axial space between the lower end **24** of the base and the bottom of the pot-shaped socket, so that foreign material, such as sand or earth which may have fallen into the socket, does not impede the safe locking of the post **10** to its anchoring socket. When a generally horizontal force is applied to the anchored guidepost, it results in a pivoting moment around the abutment point between the shoulder **16** of the post base and the upper end face of the socket which, at a certain predetermined magnitude, causes the plastic material of the generally cylindrical base **14** to yield elastically inwardly so that the cam noses can snap out, one by one, from under the socket cam portions, allowing the guidepost **10** to break away from its socket without damage to either. The bayonet-type locking arrangement permits simple reinsertion of the post into its socket by way of a rotational locking operation.

The cam noses **20**, in order to withstand the high stress and potential wear during the break-away action, are reinforced by metallic nose inserts **26** which also cover a major portion of the nose surfaces. These metallic inserts **26** are imbedded in the wall material of the post base **14** by a special procedure which will be explained in detail further below.

Because the post base **14** is of a more complex structure than the post shaft **12**, it is advantageous to fabricate it separately from the shaft **12** and to join the two sections together by a butt weld along a circumferential seam **28** (FIG. **1**). However, because this welding seam constitutes a weakened line in terms of the bending resistance of the assembled post **10**, it is preferably reinforced by an exterior reinforcing ring **30** which itself is also welded to the guidepost **10**. The reinforcing ring **30** is welded in place by only superficially heating the adjacent wall portions of the base **14** and the shaft **12** to the welding temperature, thereby avoiding any negative influence of the welding heat on the resistance of the post profile.

In order to give the guidepost shaft **12** a sufficiently high bending resistance, the shaft profile includes interior stiffening ribs **32*a*** and **32*b*** which extend diametrically across the interior of the outer shell of the shaft, linking oppositely located wall portions to one another along the shortest possible lines. These stiffening ribs **32*a*** and **32*b*** thus take the form of intersecting transverse webs which, when the guidepost is subjected to horizontal bending forces, transmit tension stresses from one wall portion to an opposite wall portion so as to give the post a greatly increased moment of resistance against bending. These stiffening ribs **32*a*** and **32*b*** extend through the entire length of the shaft **12** and are also provided in the upper portion of the post base **14**. However, they do not extend into the cylindrical portion of the base **14**, terminating along the line **32*c*** in FIG. **1**.

The metallic nose inserts **26** are made of alloy steel, preferably V2A steel. As it is not possible for parts made of this kind of steel to be positioned magnetically inside an injection mold, the base section **14** of the invention is produced in two injection molding steps, by starting with a plastic base core **34** (FIG. **4**) which is essentially a short piece of cylindrical tubing, including several protruding positioning ears **36** on its outer periphery. Each metallic nose insert **26** consists of a piece of sheet metal which is bent into a generally picture-hook-shaped multi-angular outline and includes, in its upper flat portion, an oblong positioning hole **38** matching the size of the positioning ears **36** on the base core **34**. Each nose insert **26** further includes on either side of its positioning hole **38** a punched, upended hole **40*a*** and **40*b***, respectively, whose purpose is to anchor the nose insert inside the plastic wall of the post base **14**.

Several of these metallic inserts **26** are positioned on the base core **34** by forcing their positioning holes **38** over the slightly larger positioning ears **36** of the core (FIG. **4**). The core **34** with the nose inserts **26** thus attached, is then placed into an injection mold where the post base **14** receives its final shape. In the second injection molding operation, the nose inserts **26** are partially imbedded in the additional wall material which is added to the core wall and the hollow space enclosed by the hook shape of the inserts **26** is likewise filled with plastic material to form the cam-shaped noses **20**. At approximately the level of the positioning ears **36**, the finished base molding includes a peripheral shoulder **16**, and the base portion above the shoulder **16** includes an upper length portion of cross-sectional transition from the cylindrical outline of the base core **34** and shoulder **16** to the triangular cross-section of the shaft **12**. In this transition portion, the base **14** includes the same internal stiffening ribs **32*a*** and **32*b*** as are provided in the extruded shaft profile **12**, so that an abutment joint **28** is formed between the base **14** and the shaft **12** where both sections have the same cross section. This permits convenient joining of the two sections by butt welding.

Guideposts produced in this manner have a high longevity and, in spite of their elastic structure, offer adequate stiffness and resistance against denting to withstand break-away impacts.

Where the post structure of the invention is not to be used for street guideposts, it is of course possible to choose between a great variety of different extrusion profiles for the shaft portion of the post. Because of its advantages, in particular its light weight and its capability to break away from its anchoring socket under a sufficiently high impact force, combined with its ease of re-insertion into the socket, the post structure of the invention is not only particularly suitable for a variety of traffic signalization purposes including traffic signposts, for instance, but also for demarcations and fence posts, or for the construction of the obstacles in an equine jumping parcours, for example. These applications are merely mentioned by way of examples and various additional applications of the invention could be thought of.

The cross-shaped intersection of the interior stiffening ribs **32***a* and **32***b* can be modified in a variety of ways. A particularly interesting modification consists in replacing the rib intersection **50** by a longitudinal, coaxial tubular profile, whereby the stiffening ribs no longer intersect one another, but merely link the two walls of the outer shell and inner tube on their shortest distances, thus providing the desired stiffness. Such a cross-section is called for, for example, where a street guidepost includes a telescopically extendable sign — which, as such, is known — the sign, a snow marker, for instance, being inserted into the inner tube profile of the shaft **12**, which then serves as a guide for the telescoping sign.

The FIGS. **5** through **10** show a series of different extruded shaft cross sections which all have interior stiffening ribs, the *a*-FIGURES showing the final cross-section after solidification and calibration, the *b*-FIGURES showing the shape of the extrusion die which is also that of the extruded profile before solidification shrinks and straightens the interior members of the extruded profile.

For the sake of clarity, related profile elements of the FIGS. **5** through **10** are marked with the same reference numerals. Thus, numeral **60** indicates in each case the outer shell of the profile, whose periphery **62** is cooled and calibrated in the extrusion operation in a manner described further above. Numeral **64** refers to the intersecting interval stiffening ribs (cf. **32***a* and **32***b* of FIG. **2**) of FIGS. **5** through **8** which extend between diametrically opposed points on the inner surface **66** of the shell **60.** In the FIGS. **9** and **10,** the extrusion profile includes a second coaxial tubular profile **68** located in the area of the center of the outer shell **60,** with the stiffening ribs **70** extending between opposite points on the inner tubular profile **68** and on the surface **66** of the shell **60.**

The cooling and calibration operations on the outer shell **60** of the extrusion profiles give them a smooth outer surface **62** which has the desired diameter within the tolerances required. The gradual and much slower cooling and solidification of the inner cross-sectional elements **64, 68,** and **70,** and the concommittant shrinkage of these members, would create stresses and cracks or distortions in the shells **60,** were it not for the fact that these elements, as shown in the *b*-FIGURES, are extruded with a cross-sectional curvature, giving them an excess length for shrinkage. Through cooling and shrinkage, these interior members become substantially straight stiffening elements, as shown in the *a*-FIGURES, capable of transmitting tension stresses between opposite points on the surface **66** of the outer shell **60.** Knowing the rate of shrinkage of the extrusion material and the temperature conditions in the extrusion process, it is easy to compute for each interior profile element the excess length required in extrusion and the curvature to be used, so that the final profile combines a maximum of profile stiffness, through straight stiffening ribs, with a good overall elasticity through the absence of solidification stresses.

I claim:

1. A hollow plastic post for street markers and the like comprising in combination:

an elongated hollow post shaft in the form of a continuous profile of plastic material;

a post base solidly connected to the lower end of the shaft; and

means for anchoring the post base to the ground;

the profile of the shaft including a closed outer wall in the form of a shell, and several interior stiffening members integrally connected to the shell, thereby increasing the bending resistance of the shaft profile, wherein

the post base is likewise of plastic material and hollow, and includes a lower anchoring portion of substantially cylindrical outline and an upper transition portion, by which it is solidly connected to the lower end of the shaft;

the anchoring means include a plurality of cam noses near the lower end of the anchoring portion of the post base, the cam noses being angularly spaced apart and radially protruding from the outer periphery of the anchoring portion and including each a metallic nose insert;

the anchoring means further including a radial shoulder on the anchoring portion at a distance above the cam noses, the shoulder having a radius greater than that of the cam noses;

the anchoring portion with its shoulder and cam noses being thus adapted to be locked into a fixed anchoring socket in the manner of a bayonet lock, if the anchoring socket has a matching bore with an upper end face to support the shoulder and matching interior locking noses in the form of radial protrusions which can be engaged from underneath by the cam noses;

the wall of the hollow anchoring portion being adapted to yield radially inwardly to permit the cam noses to successively snap out from under the locking noses of an anchoring socket as described earlier, when a horizontal force is applied to the post shaft which creates a predetermined pivoting moment on the base, thus causing the post to break away from the anchoring socket without damage to either.

2. A post as defined in claim **1,** wherein

each nose insert forms a surface portion of the cam nose to protect it against fracture and wear, the nose insert being at least partially imbedded in the wall material of the anchoring portion of the base.

3. A post as defined in claim **2,** wherein

each metallic nose insert has the general outline of a hook with a cradle portion, the cradle portion of the hook enveloping the nose on its outer peripheral surface and on at least the two axially-facing sides of the nose, the upper portion of the insert being imbedded and mechanically anchored in the wall material of the anchoring portion of the base at a point above the cam nose.

4. A post as defined in claim **1,** wherein

the transition portion of the post base terminates on its upper end in an end profile which has substantially the same dimensions as the shaft profile, the shaft and the base of the post being butt-welded to one another, and the welding seam thus created being covered by a reinforcing ring which in turn is welded to the shaft and to the post base.

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