Title
A plastic running rail

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A PLASTIC RUNNING RAIL

The invention refers to a plastic running rail comprising a low cost plastic internal substrate covered by a UV-resistant plastic skin.

Figure 1
A PLASTIC RUNNING RAIL

The invention relates to a plastic running rail and a race barrier fence comprising such a plastic running rail.

A process for manufacturing said plastic running rail is also concerned.

Context and state of the art:

Racetracks for horses use a barrier along the longitudinal sides of the track to demarcate inner and outer boundaries of the track where races are conducted for horses to run.

They are usually white in colour to provide the required demarcation.

The running rails are installed on uprights, or posts, spaced apart by a certain gap, preferentially of 3 meters. A lower base of each post is connected to the ground. The base is usually set back behind the rail and follows a curve or a diagonal form from the base to the rail in a plane transversal to the length of the rail.

Such running rails on set back posts are typically manufactured in easily transportable lengths, preferably 12 meters long, and are connected end-to-end by some form of unbreakable connection.

To improve safety to both the jockeys and the horses, it is recommended that the running rails not only demarcate the safe and permitted area of the track available for the horses to run, but also offer a resilient boundary in case of impacts with a horse or a jockey moving in a somewhat transversal direction. To
obtain this functionality, the rails and posts are typically made from a plastic material.

Further, to focus on the above functionality, the rail has to remain resilient to the transversal component of the impact forces of a horse, typically travelling at speeds of up to 50 km per hour with a mass of 500 kg.

For cost-efficient manufacturing, these rails and posts are preferentially manufactured from the least expensive, or "low cost", plastic materials such as PVC or PE, using the known profile and tube extrusion processes.

The rail profiles and tubes (for the uprights) typically have wall thicknesses of 2 mm to 8 mm and lineal masses of around 2 kg per meter.

These plastic rail profiles and tubes can be extruded to the necessary tolerances to offer the rigidity necessary for a running rail to resist elastically the transversal impacts of horses.

**Drawbacks of known techniques:**

The capability of the above-described running rails made from usual plastic materials to resiliently resist the transversal impacts of a horse or jockey diminishes with prolonged exposure to outdoor climatic conditions and notably to the UV rays from sunlight and the outdoor humidity.

These UV rays tend to break down the polymer chains of the usual low cost plastic materials such as PVC or PE.

The degradation takes place well before a useful lifetime of the product, preferably twenty years or more.
It is accelerated by water molecules present in the outdoor humidity.

It is known that the UV rays and humidity alter the mechanical properties of such PVC extrusions, rendering over time such profiles and tubes brittle rather than elastic; as such they no longer resiliently resist the above-mentioned impacts, but rather split open, snap and break allowing the horses trajectory to exit the track. Such situations can give rise to dangerous collisions with obstacles and people situated outside of the track.

Alternative plastic materials include PP (polypropylene); but profiles made from PP that are exposed to the UV rays in sunlight, become soft and lose resilience.

Suppliers of such plastic materials are able to enhance their resistance to UV rays by incorporating reflective additives such as TiO₂ into the materials. This increases the material costs but only partially improves the resistance to UV rays and the durability of the extruded profiles.

**Summary of the invention:**

For an improved durability, it is recommended by the invention to provide a plastic running rail comprising a low cost plastic internal substrate covered by a UV-resistant plastic skin.

Further, at least one of the following features will preferably be considered:

- the material of the substrate is one of vinyl and polyolefin,
- the material of the skin is one of an acrylic material and a styrene material,
- the material of the skin is one of PMMA (Polymethylmethacrylate) and ASA, (Acrylic Styrene Acrylonitrile),
- the surface skin has a thickness which is between one tenth and one fifth of the thickness of the profile mass substrate,
- the skin has a thickness which is between 0.15 mm and 0.5 mm,
- the substrate has a continuous external surface covered by and bonded with said UV-resistant plastic skin (through said co-extrusion), forming a single profile body.

Concerning the race barrier fence recommended by the invention, it will advantageously comprise the above-described plastic running rail and plastic uprights secured thereto at positions along the rail, each upright being secured at an upper end to the rail and at a lower end to a ground anchor.

Preferably, the race barrier fence will also include at least one of the following features:
- each plastic upright comprises a length of tubing comprising a low cost plastic internal substrate covered by a UV-resistant plastic skin,
- the material of the substrate is one of vinyl and polyolefin,
- the material of the skin is one of an acrylic material and a styrene material.

As regards the process for manufacturing the plastic running rail, it is recommended that it includes
the step of co-extruding the internal substrate plastic material and the surface skin plastic material.

Advantageously, this process will further include at least one of the following features:

- the step of co-extruding comprises the step of simultaneously co-extruding one of vinyl and polyolefin, as substrate material, and one of an acrylic material and a styrene, as skin material,
- the step of co-extruding comprises the step of simultaneously co-extruding:
  * a substrate made from one of vinyl and polyolefin, as said substrate material, and, having a continuous external profile, and,
  * one of an acrylic material and a styrene, as surface skin material covering the continuous external profile,
- the continuous external (surface of the) profile has a thickness comprised between 1.5 mm and 8.0 mm (preferably 1.5 mm and 3.5 mm), and the surface skin has a thickness comprised between 0.15 mm and 0.5 mm.

Brief description of drawings:

In the attached drawings which show, as an example, a preferred embodiment:

- figure 1 is a general view of a race barrier fence including a plastic running rail 1 in conformity with the invention,
- figure 2 is a side view of the illustration of figure 1 in which the race barrier fence is anchored to the ground, at its lower end,
- figure 3 shows the zone III of figure 1, and,
- figure 4 shows the zone IV of figure 2.
Detailed description for carrying out the invention:

Figure 1 shows a plastic running rail 1 comprising a low cost plastic internal substrate 3 covered by a UV-resistant plastic skin 5.

The material of the substrate 3 is preferably one of vinyl and polyolefin.

The material of the skin 5 is one of an acrylic material and a styrene material.

The durability, process of manufacturing and life-cycle costs are consequently improved.

Advantageously, the material of the skin will be PMMA (Polymethylmethacrylate) or ASA (Acrylic Styrene Acrylonitrile).

It is recommended for an improved compatibility between costs - durability - mechanical resistance - flexibility that the surface skin 5 has a thickness $e_1$ which is between one tenth and one fifth of the thickness $e_2$ of the profile mass substrate; see figure 3.

A right choice for thickness $e_1$ is between 0.15 mm and 0.5 mm.

The illustrated substrate 3 is internally partitioned by partitioning walls, such as 13a, 13b, 13c.

Figure 1, the substrate 3 shows around these internal walls a continuous external profile, or surface, 130 covered by the UV-resistant plastic skin 5.

Figure 2, the plastic running rail 1 is incorporated into a race barrier fence 7.

Plastic uprights 9 are secured to the running rail 1 at positions along said rail.
Each upright 9 is secured at an upper end 9a to the rail 1 and at a lower end 9b to a ground anchor 11.

At the upper end, a plastic strut 12 (for example made from PVC (polyvinyl chloride) can be forwardly detachably secured (clamped) to slits 120a, 120b formed at the rear side of the rail 1, and, rearwardly, fixedly secured to one of said uprights 9.

At the lower end 9b, each upright (which can be a length of tubing) can internally receive a tube 14 erected on a plate 16 to be disposed on ground 18. A stake 20 extends below the plate 16 for anchoring the ground anchor 11 into the ground.

In figure 4, the plastic upright 9 comprises a length of tubing 90 comprising a low cost plastic internal substrate 19 covered by a UV-resistant plastic skin 21.

Preferably, the material of the substrate 19 will be vinyl or polyolefin.

And the material of the skin 21 will advantageously be an acrylic material or a styrene material.

The thickness $e_3$ of the surface skin 21 can be comprised between 0.15 mm and 0.5 mm. The thickness $e_4$ of the substrate tubing 19 can be between 2.5mm and 8 mm.

As above-explained, it is recommended that the process for manufacturing the plastic running rail 1 according to the invention comprises the step of co-extruding the plastic material of the internal substrate 3 and plastic material of the surface skin 5.

It is even recommended that the step of co-extruding comprises the step of simultaneously co-extruding a vinyl or polyolefin material, as plastic
substrate material, and an acrylic material or a styrene, as UV-resistant skin material.

Advantageously, will be simultaneously co-extruded:

- the substrate 3 made of vinyl or polyolefin, as said substrate material, and having the continuous external profile 130, and,

- for obtaining skin 21, said acrylic material or styrene, as surface skin material covering the continuous external profile 130.

As regards the thicknesses, it is recommended that the co-extruded continuous external profile 130 and surface skin 21 respectively have a thickness comprised between 1.5 mm and 8.0 mm (preferably 1.5 and 3.5 mm), and between 0.15 mm and 0.5 mm.

The above-described features will imply the profile cost to be more expensive than using just the substrate 3, but significantly lower than a profile made solely from a UV-resistant plastic material.

Preferably, the rail profiles will be extruded by simultaneously pushing both heated materials in fluid form through separate channels of an extrusion die, and allowing the two materials to bond inside the die as they form a single profile body. The temperatures required to heat the two materials to the required fluid form, will remain compatible; that means that any temperature difference in such a process will remain sufficiently small so that the hotter material does not burn the cooler one.

As current trends for recycling are becoming more prevalent, it is to be noted that in the future, it will very probably be required to ensure that rail profiles,
and more generally plastic items, include more than one material be capable of being recycled at the end of the product's lifetime. This requires a careful matching of the materials. In conformity with the invention's approach, for example a recycled compound of a profile including ASA and PVC can be re-used as a recycled extrusion substrate.

Additional details of the barrier fence, rail... can be found in AU 2005202084, the content of which is included in the present description, by reference.

AU 200154133 gives other details of an other embodiment which can also be used as a barrier fence and over the "substrate material" of which a surface skin can be disposed, as explained above.
Claims

1. A plastic running rail comprising a low cost plastic internal substrate covered by a UV-resistant plastic skin.

2. The plastic running rail according to claim 1, wherein the material of the skin is one of an acrylic material and a styrene material.

3. The plastic running rail according to claim 1 or 2, wherein the material of the substrate is one of vinyl and polyolefin.

4. The plastic running rail according to anyone of the preceding claims, wherein the material of the skin is one of PMMA (Polymethylmethacrylate) and ASA (Acrylic Styrene Acrylonitrile).

5. The plastic running rail according to anyone of the preceding claims, wherein the surface skin has a thickness which is between one tenth and one fifth of the thickness of the profile mass substrate.

6. The plastic running rail according to anyone of the preceding claims, wherein the skin has a thickness which is between 0.15 mm and 0.5 mm.

7. The plastic running rail according to anyone of the preceding claims, wherein the substrate has a continuous external profile covered and bonded with said UV-resistant plastic skin to form a single profile body.
8. A race barrier fence comprising the plastic running rail according to anyone of the preceding claims and plastic uprights secured thereto at positions along the rail, thereof, an upright being secured at an upper end to the rail and at a lower end to a ground anchor.

9. The race barrier fence according to claim 9, wherein one plastic upright comprises a length of tubing comprising a low cost plastic internal substrate covered by a UV-resistant plastic skin.

10. The race barrier fence according to claim 10, wherein the material of the substrate is one of vinyl and polyolefin.

11. The race barrier fence according to claim 10 or 11, wherein the material of the skin is one of an acrylic material and a styrene material.

12. A process for manufacturing the plastic running rail according to anyone of the claims 1 to 8, comprising the step of co-extruding the internal substrate plastic material and the surface skin plastic material.

13. The process according to claim 12, wherein the step of co-extruding comprises the step of simultaneously co-extruding one of vinyl polyolefin, as substrate material, and one of an acrylic material and a styrene, as skin material.
14. The process according to claim 12, wherein the step of co-extruding comprises the step of simultaneously co-extruding:
   - a substrate made of one of vinyl and polyolefin, as said substrate material, and having a continuous external profile, and,
   - one of an acrylic material and a styrene, as surface skin material covering the continuous external profile.

15. The process according to claim 14, wherein the continuous external profile has a thickness comprised between 1.5 mm and 8.0 mm, and the surface skin has a thickness comprised between 0.15 mm and 0.5 mm.