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Description

The invention relates to a waterproof sealing web, which is particularly suitable for use in construction above and under ground.

It is known to use plastic sheets as sealing materials by placing the sheet-like webs in overlapping manner on a substrate, whilst placing a strip or tape of pressure-sensitive profiled adhesive compound, e.g. butyl rubber between the sheets for joining the webs in the overlapping area. The necessary adhesive tape is placed between two layers of removable protective foil, e.g. siliconized paper, for transportation and handling, DE-A 25 10 162 discloses rubber sealing material webs provided with an adhesive tape during manufacture. One adhesive tape is applied along one longitudinal edge on the upper surface and a further adhesive tape is provided at the opposite longitudinal edge at the under side of the web. The adhesive tapes may be covered by a silicone paper.

The sheets of sealing material can also be welded by solvents or by heating. However, the application of such sealing webs is very complicated and time-consuming and even slight imprecisions when inserting the adhesive tape or during welding in the overlapping area can lead to an untight joint.

A sealing web known from German Utility Model 79 07 342 comprises a bitumen layer, provided on its underside with a non-woven fabric and whose top is covered with sand, a bare, uncovered area being provided in the edge region for joining purposes. Heating is necessary for welding the webs.

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DE-A 1 621 939 discloses sealing materials comprising a flexible film having a coating of a pressure-sensitive adhesive and sealing compound. The preferred material for the sealing compound is a bitumen/rubber composition. This material is also applied in web-like overlapping manner in such a way that the adhesive sealing compound adheres to the substrate to be sealed and is protected by the covering film. In the overlapping area, the adhesive and sealing compound of the upper web rests on the covering film of the lower web, so that a bond is obtained between the compound and the film.

If the webs are not laid completely smoothly, e.g. due to an unevenness of the substrate or in the case of stresses due to temperature fluctuations, there can be an incomplete bond between the sealing compound and the film in the overlapping area and capillaries can form through which water can penetrate.

US-A 41 72 830 discloses modifying the above material sealing material in such a way that to the bitumen/rubber material is applied as a top layer an externally siliconized polyethylene film and which does not cover a roughly 10 cm wide edge region, the latter being covered with a removable protective film. In the case of overlapping application webs this gives a better bond, but no further material can be adhered to the siliconized surface. In addition, it is not possible to use bitumen-coated sealing webs everywhere, for example they are not suitable for laying on certain polystyrene thermal insulating materials which are being increasingly used in the completion of interiors and for roof coverings.

US-A 39 00 102 discloses a sealing web comprising a sealing compound being a support film and a protective film of silicone paper, the latter being removed prior to using the

material. Thus, there is a firm bond between sealing material and substrate with all the resulting disadvantages. Due to the cold flow of the sealing compound under pressure action the material can be laterally squeezed out. However, such a cold flow cannot be controlled, so that this projecting portion contributes little to the secure bonding together of the webs. The connection of the overlapping webs consequently substantially takes place between the self-adhesive sealing compound of the upper web and the support film of the lower web.

It is the object of the invention to develop a sealing web having not only the advantages of conventional materials, but which can also be applied in a troublefree, easy manner, whilst providing a completely waterproof layer. The invention is more particularly intended to provide a reliably tight, homogeneous joint in the overlapping area of the sealing webs. The material is applicable to all types of substrates and further adhesive materials may be applied on top of it.

The invention relates to a sealing web for use in construction above and under ground comprising a resilient elastic pressure-sensitive adhesive and sealing composition enclosed between two flexible layers, said lower layer not covering the sealing composition in the vicinity of one longitudinal edge of the web and thus forming a projecting portion for the overlapping connection of the webs, characterized in that the lower layer not removably connected to the sealing composition does not cover the sealing composition in the vicinity of the facing longitudinal edge and thus forms a projecting portion for the overlapping connection of the webs.

Thus, over the entire overlapping region of the webs, there is a reliable bond by contact between the individual sealing compositions. However, in US-A 39 00 102 the sealing

compositions can only be bonded together in the regions where there is no cold flow, i.e. corresponding pressure application has led to sealing composition passing out over the edge of the support film, which is only the case at certain points.

According to a preferred embodiment the upper layer in the vicinity of one longitudinal edge and the lower layer in the vicinity of the other longitudinal edge leave free a narrow strip of sealing composition as a fixing edge, which is in each case located on the side opposite to the overlapping portion.

Bitumen/rubber mixtures are particularly suitable as the sealing compound, their excellent temperature characteristics being particularly important. They can still be bent by 180° down to -30°C and even at temperatures of $+80^{\circ}\text{C}$ still show no plastic flow, i.e. they have an adequate thermal stability. It is possible to lay the sealing webs at temperatures as low as about 0°C , because the pressure-sensitive adhesive properties of the sealing compound are adequate for a homogeneous joint. A suitable sealing compound for the sealing web according to the invention is formed e.g. from 40 to 80 parts by weight of bitumen (softening temperature 60 to 100°C according to DIN 1995), 15 to 45 parts of aromatic oil and 5 to 15 parts of rubber, e.g. styrene/butadiene copolymer. The layer thickness of the self-adhesive sealing compound is approximately $0,4$ to 3 mm, preferably between 1 and 2 mm, particularly about $1,5$ mm.

The sheets are preferably made from polyvinyl chloride or fluoride, EPDM rubber, butyl rubber, chloroprene or natural rubber, i.e. materials with an adequate elasticity, which do not tear or break even under high mechanical or thermal stresses, particular preference being given to polyolefin

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films, i.e. film formed from polyethylene or polypropylene, as well as laminated sheets of polyethylene or polyethylene/polypropylene which may be mono- or biaxially oriented. The thickness of the sheets is between 40 and 500, preferably between 60 and 200 and more especially approximately 100 microns. When using laminated sheets, it is possible to laminate two sheets with a thickness of in each case 50 microns.

For certain purposes metal sheets are suitable, although they have a lower elasticity. When using metals, e.g. aluminium or copper, it is particularly advantageous to use metal-deposited plastic sheets or laminated metal/-plastic sheets, e.g. an aluminium foil between two polyethylene sheets. Such sheets are characterized by a particularly good moisture impermeability which makes them very suitable e.g. for use in cold store construction.

The sealing web according to the invention can also be constructed in such a way that the upper flexible layer is formed by a film, and the lower layer by a non-woven fabric or a plastic sheet lined with a non-woven fabric. In this way, a sealing web is obtained which can be bonded to a substrate in a much more advantageous manner than a plastic foil by means of adhesives and this can be particularly desirable if, after laying, a weight has to be applied to the sealing webs, e.g. with the aid of ballasting. Another possibility is for the lower flexible layer of the sealing web according to the invention to comprise a metal wire or fabric screen so that by pressing into the substrate thorough adhering can be achieved (zonal self-bonding with the substrate). In the seam or overlapping area between the webs, the homogeneous, tight joint is obtained in all these cases through one self-adhesive lateral area being positioned over another.

The sealing webs according to the invention can be produced



and used in different widths. A favourable width is approximately 0.9 to 1.2 m. The width of the self-adhesive area on the upper face of the web along one side and the lower face along the opposite side should be up to 10 cm, e.g. approximately 2 to 8, particularly 4 to 7 but especially 7 to 8 cm. Compared with the materials of DE-OS 1 621 931 it is an additional advantage of the sealing web according to the invention that the overlapping area can have a smaller width, because a particularly homogeneous and tight joint is obtained by the meeting of two areas with the pressure-sensitive sealing compound.

The optionally provided fixing edge is normally much narrower than the facing projecting portion for the overlapping connection of the webs. Thus, the fixing strip preferably has a width of about 0.5 to 2, especially about 1 cm. The fixing edge serves to secure the sealing webs to the substrate without additional means, which considerably simplifies the application of the material. The fixing edge on the upper side of the material is also useful for securing further layers, e.g. a protective non-woven fabrics or the like.

For storing and transportation the adhesive areas of the sealing web according to the invention are advantageously covered with a removable protective foil, which is removed on laying the material. Siliconized paper is preferably used.

In the sealing web formed from a resilient pressure-sensitive adhesive and sealing compound between two flexible layers in accordance with the present invention, the upper layer to a certain extent floats on the lower which significantly compensates mechanical or thermal stresses. Furthermore, this material combines the characteristics of a simple plastic foil and a plastic foil coated with a sealing compound.

It can be laid wherever it is not possible to directly apply bitumen or adhesive substances, either by pouring, coating or in the form of bitumen support sheets. Compared with simple sheets, the material has self-healing properties, because the sealing compound itself closes holes in the two cover foils, e.g. of the type which can occur with the passage of individual gravel particles when laying the materials.

The use of thin individual sheets gives the overall web a very considerable flexibility, which is better than that of thick sealing webs formed from a single sheet of a comparable strength.

The manufacture of the inventive sealing web with a pressure-sensitive adhesive and sealing compound enclosed between two flexible layers can take place in particularly advantageous manner by supplying the two layer materials, e.g. two foils from above and in hopper-like manner to a roller frame with two cooled rollers and in each case in one edge area a siliconized paper strip is also supplied in overlapping manner with a somewhat greater width. The sealing compound is fed into the hopper or funnel formed by the two supplied sheets and the siliconized paper and the layer thickness of the sealing compound and simultaneously that of the finished sealing web are controlled by the spacing of the two rollers. The area on the two longitudinal sides serving to bond the sealing web during subsequent overlapping laying are obtained in that the sheets do not extend up to the edge but in each case are instead replaced by the removable siliconized paper.

The invention is further illustrated hereinafter by the drawings in which

Figure 1 shows a perspective sectional view of a sealing web according to the invention.

Figure 2 shows a section through two sealing webs according to the invention joined in an overlapping manner.

The sealing web of figure 1 comprises a self-adhesive sealing compound 11 between two sheets 12 and 13. The upper sheet 12 does not extend to longitudinal edge 17, so that in the vicinity thereof a strip of adhesive sealing compound is exposed in the longitudinal direction. Similarly, the lower sheet 13 does not extend to the opposite longitudinal edge 16, so that in the vicinity thereof there is an exposed self-adhesive area at the bottom. The self-adhesive areas at the two edges of the upper and lower faces of the sealing web are in each case covered with removable protective foils 14, 15 (e.g. of siliconized paper), which are removed on laying the webs. For easier removal the protective foil preferably laterally projects.

When the webs are laid in overlapping manner, edge 16 comes to rest on edge 17, so that the areas of the self-adhesive sealing compound 11 not covered by sheets 12 and 13 directly meet one another, leading to a homogeneous, durable and waterproof joint. In figure 2, a completely satisfactory joint is achieved with an overlap of the webs, in which the adhesive layers substantially directly engage one another, but in part bonding takes place between the adhesive layer and the sheet.

In the embodiment shown in figure 2 foils 13' and 12' opposite to foils 12 and 13 leave a narrow strip 18, 19 of the sealing composition 11 uncovered. A fixing edge is thereby formed, which considerably simplifies the application of the sealing webs. The fixing edge 19 on the underside leads to adhesion to the substrate, while the fixing edge 18 on the upper face can be used to secure further layers. The protective foils 14, 15 prevent bonding of the material in the vicinity of the fixing edges during storage and transport.