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(56) Documents cited
GB A 2131734 GB 1563016 GB 1056133
GB A 2070116 GB 1542283

(58) Field of search
B5A
E1J

(54) Method of and apparatus for extruding sealing strips

(57) The sealing strips which can be affixed to webs comprise a clamping strip 3 made of a hard rubber which is U-shaped in cross-section, in which inwardly pointing sealing lips 4 made of a soft rubber are provided on the inner surfaces of the clamping strip's limbs 3a, and an outwardly pointing sealing hose 2 made of a soft (foam) rubber is arranged on the web of the U-shaped clamping strip 3. Despite the use of a sealing hose 2 which cannot easily be buckled, sufficiently high draw-off forces can be applied to the webs. In accordance with the invention, the three different materials of the sealing strip are each delivered to the extrusion die from a separate extruder (Fig. 2), the material for the sealing lips 4 being fed over a considerably shorter feed path in a die head, or respectively in the die thereof, than the materials for the clamping strip 3 and the sealing hose 2.

FIG. 1

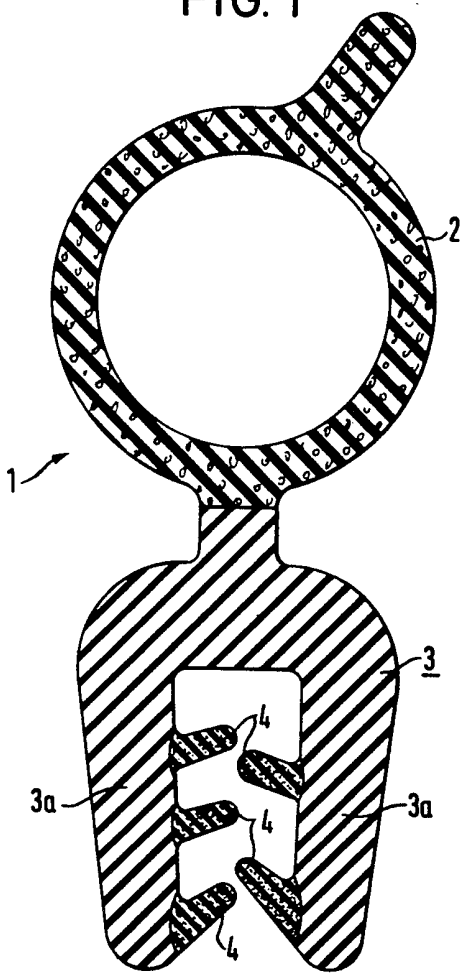

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FIG. 1

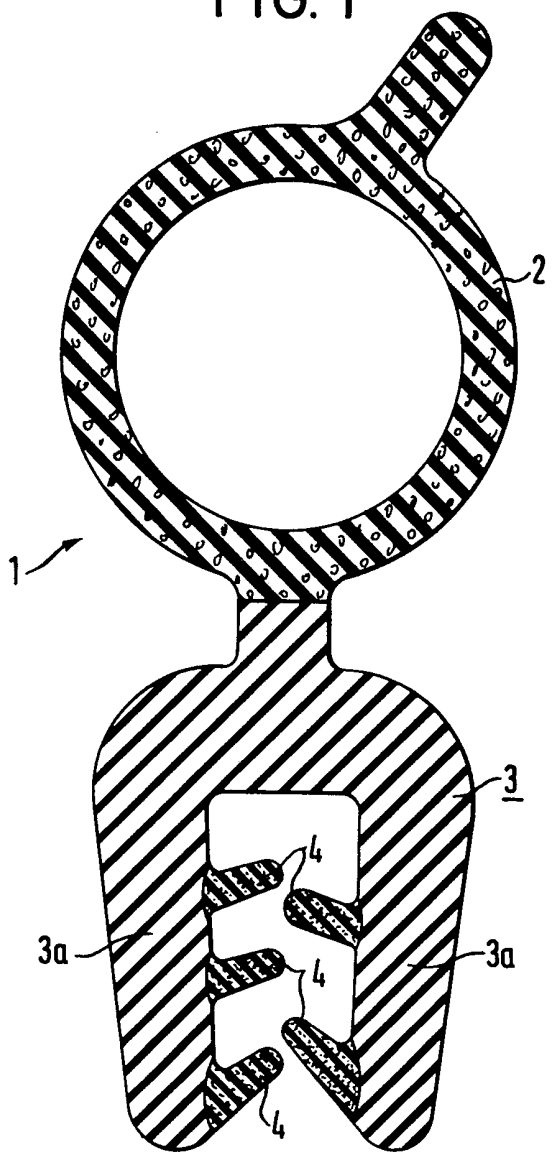
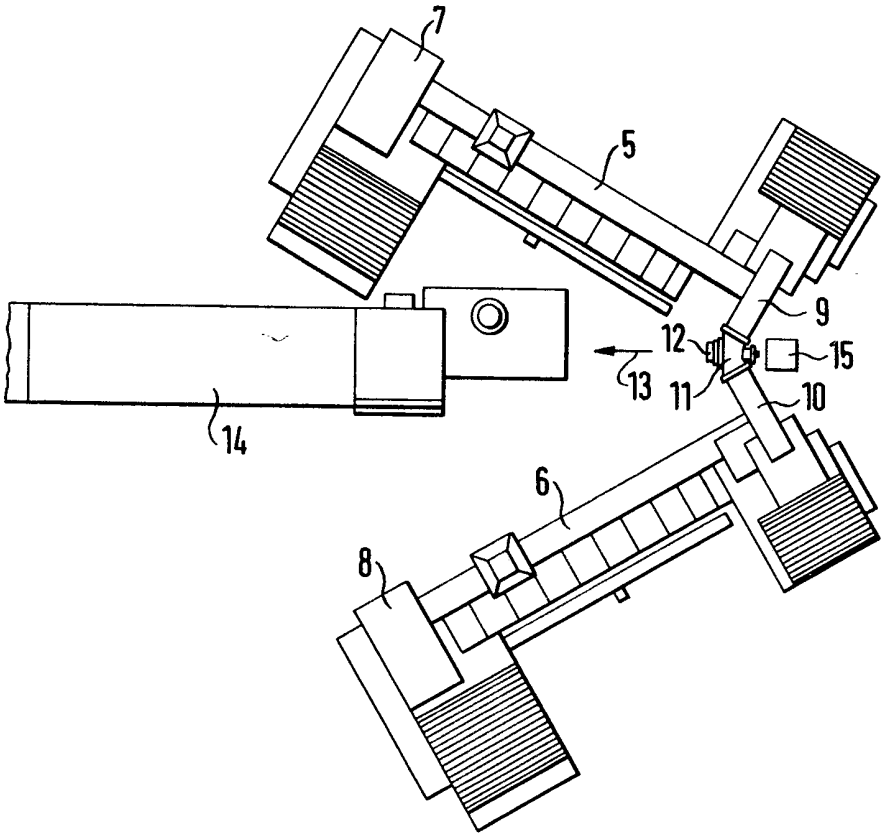


FIG. 2



SPECIFICATION

Method of and device producing sealing strips

The invention relates to a method of producing sealing strips or profiles which can be fixed, affixed, or slipped on to webs, such as joint seals for motor vehicles, more especially for edges of engine spaces and luggage boots or the like, in which respect the sealing strip comprises a clamping strip made of a hard rubber which is U-shaped in cross-section and in which inwardly pointing sealing lips made of a soft rubber are provided on the inner surfaces of the limbs of the U-shaped clamping strip, in which respect an outwardly pointing sealing hose or tube made of a soft rubber is arranged on the web of the U-shaped clamping strip and in which respect the various materials are fed by means of separate extruders to a common mouthpiece.

Insofar as rubber has been stated above, also rubber-like plastics material is meant.

Sealing strips of this kind can also be used to seal off sheet-metal boxes of a different kind, for example to seal off the doors of switch cabinets.

In the case of a known method of this kind, two separate extruders are provided, which feed the two different materials to a common mouthpiece, in which respect inside the mouthpiece the flow of material of the soft rubber is split up into that for the sealing lips and into that for the sealing hose.

What is disadvantageous in the case of the strip seals produced in this way is the fact that a soft-rubber hose is not suitable for a profile seal which can be conducted around comparatively small radii, because such a hose tends to buckle. If such a hose is, however, buckled, then it cannot fulfil, or can only incompletely fulfil, its sealing function and is, moreover, exposed to increased wear and premature destruction.

Now, it is already known to produce such sealing hoses from foam rubber, in other words from a foam-like soft rubber, which tolerates fairly great elongations and compressions without buckling. Sealing hoses made of foam rubber can thus be conducted over relatively small radii. In this connection it is further known to make, in addition to the sealing hose, also the sealing lips of the clamping strip from foam rubber, since these sealing lips have to have relatively great elasticity. In the case of the method of producing a sealing strip designed in this way, in other words also two materials are present, namely on the one hand the hard rubber for the clamping strip and on the other hand the foam rubber for the formation of the sealing hose and of the sealing lips, so that, as in the case of the previously described method, the material flow can be split for the sealing hose and the sealing lips.

However, what is disadvantageous in the case of such a sealing strip is the fact that the sealing lips made of foam rubber, by reason of their great deformability, do not develop sufficient adhesive force relative to the web onto which the sealing strip is attachable or can be slipped, so that the sealing strip can be drawn off once more from the web with relatively slight forces.

On the other hand, such a sealing strip could be produced only because the same material was used for the sealing hose and the sealing lips, so that the slight amount of material for the sealing lips could be branched off.

Accordingly, the problem underlying the invention is to provide a method, of the kind mentioned at the beginning hereof, with which the production of a sealing strip is possible which does not have the disadvantages of the known sealing strips and in the case of which, despite use of a sealing hose which cannot be easily buckled, sufficiently high draw-off forces can be applied to the webs.

In accordance with the invention, this problem is solved in that the sealing strip comprises three different materials, namely of foam rubber for the sealing hose, of a hard rubber for the clamping strip and of a soft rubber for the sealing lips, in which respect for all three materials in each case a separate extruder is provided and in which respect the material for the sealing lips is fed over a considerably shorter feed path in an injection head or mouthpiece thereof than the materials for the clamping strip and the sealing hose.

With such a method the result is achieved that, through the use of foam rubber for the sealing hose, the profile seal can be conducted over narrow radii, but through the use of non-porous soft rubber for the sealing lips the necessary draw-off forces are applied. For the relatively small amount of material for the sealing lips, in accordance with the invention provision is made for the fact that the feed path for the material of the sealing lips is considerably shorter that the feed path for the two remaining materials, so that a satisfactory connection of all the materials ensues and a combustion or a vulcanising-on of this relatively slight amount of material in its feed duct or channel is effectively prevented.

In the case of a device for carrying out the method in accordance with the invention, extruders for the sealing hose and for the clamping strip have in each case a relatively large initial cross-section, which is reduced over a fairly long feed duct to the end cross-section, whilst an extruder for the sealing lips has a considerably smaller initial cross-section, which is reduced over a fairly short feed duct to the end cross-section.

In this respect it is particularly advantageous if the extruders for the sealing hose and the

clamping strip are arranged laterally to the injection head in which respect the feed ducts with which the reduction in cross-section is produced extend in a fairly large portion of the injection head. The injection head is, in this respect, the tool holder into which the actual tool, namely the mouthpiece, is inserted.

The extruder for the material of the sealing lips is advantageously connected, in the region of the front portion of the mouthpiece of the injection head, to this. In this way a very much shorter path of the material of the sealing lips becomes possible. Depending on the embodiment of the injection head, the material can enter at the front end of the mouthpiece into this and be deflected inside the mouthpiece through about 180°, so that the material emerges in the connection direction once more from the mouthpiece. Another possibility consists in shifting the connection of the relevant extruder to or on the mouthpiece back, so that it lies approximately perpendicularly to the axis of the mouthpiece.

It is particularly advantageous if the extruder which feeds the material for the sealing lips is arranged perpendicularly.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Fig. 1 is a cross-section of a sealing strip which can be produced by the preferred method in accordance with the invention; and

Fig. 2 is a schematic plan view of a preferred embodiment of the extrusion device for effecting the preferred method in accordance with the invention.

Referring firstly to Fig. 1, the illustrated sealing strip which can be made by the preferred method and device of the invention comprises a sealing hose 2, a clamping strip 3 of U-shaped cross-section connected to the sealing hose 2 and having inwardly-pointing sealing lips 4 on the inner surfaces of its limbs 3a.

By the preferred method in accordance with the invention, sealing strips can be produced which comprise three different materials, namely of foam rubber for the sealing hose 2, of a hard rubber for the clamping strip 3 and of a soft rubber for the sealing lips 4. This is so in order on the one hand to make the sealing hose 2 so that it cannot easily buckle when being conducted around tight radii and on the other hand to be able to apply sufficiently high draw-off forces to the web onto which the sealing strip is affixed.

Fig. 2 is a schematic plan view of an extrusion device for carrying out the method in accordance with the invention so that sealing strips of the kind shown in Fig. 1 can be produced.

The extrusion device shown in Fig. 2 comprises two worm extruders 5 and 6, respective driving motors of which are designated by reference numerals 7 and 8. The worm extruders 5 and 6 convey the material that is to be extruded in each case into a shearing head 9 or 10 respectively, each shearing head 9, 10 being provided with a rotating mandrel and in which the material is heated from approximately 80° C to approximately 110° C. Linking to the shearing heads 9 and 10 is an injection head 11, the mouthpiece of which is designated by reference numeral 12. Material emerging from the mouthpiece 12 is fed in the direction of the arrow 13 to a cross-linking section or reticulation section 14.

A third extruder 15, which for the sake of clearer representation is shown offset to the right in Fig. 2, is arranged above the injection head 11 and extends perpendicularly to the drawing plane in accordance with Fig. 2.

By means of one of the two extruders 5 and 6, the material of the sealing hose 2, in other words the foam rubber, is fed to the injection head 11 and with the other extruder the material of the clamping strip 3 is fed to the injection head 11. The very much smaller amount of material for the sealing lips 4 is fed to the injection head 11 by means of the perpendicularly arranged extruder 15. The extruder 15 can in this respect more especially be connected directly to the mouthpiece 12, in which respect the material for the sealing lips 4 enters perpendicularly from above into this and is deflected inside the mouthpiece 12, so that the feed path for the material of the sealing lips 4 is considerably shorter than the feed path for the two remaining materials. The feed paths for the materials for the sealing hose 2 and for the clamping strip 3 can lead over or by way of the injection head 11 and are considerably longer than the feed path for the material of the sealing lips 4.

Moreover, the extruders 5 and 6 for the sealing hose 2 and for the clamping strip 3 have a relatively large initial (exit) cross-section, whilst the extruder 15 for the sealing lips has a considerably smaller initial (exit) cross-section.

CLAIMS

1. A method of producing sealing strips which can be fixed to webs, such as joints seals for motor vehicles, more especially for edges of engine spaces and luggage boots or the like, in which respect the sealing strip comprises a clamping strip made of a hard rubber which is U-shaped in cross-section and in which inwardly pointing sealing lips made of a soft rubber are provided on the inner surfaces of the limbs of the U-shaped clamping strip, in which respect an outwardly pointing sealing hose made of a soft rubber is arranged on the web of the U-shaped clamping strip and in which respect the various materials are fed by means of separate extruders to a common mouthpiece, characterised in that the sealing strip comprises three different materials, namely of sponge rubber for the sealing hose, of a hard rubber for the clamp-

ing strip and of a soft rubber for the sealing lips, in which respect for all three materials in each case a separate extruder is provided and in which respect the material for the sealing lips is fed over a considerably shorter feed path in an injection head or mouthpiece thereof than the materials for the clamping strip and the sealing hose.

2. A device for carrying out the method as claimed in claim 1, characterised in that extruders for the sealing hose and for the clsmping strip in each case have a relatively large initial cross-section, which is reduced over a fairly long feed duct to the end cross-section, whilst an extruder for the sealing lips has a considerably smaller initial cross-section which is reduced over a fairly short feed duct or channel to the end cross-section.

3. A device as claimed in claim 2, characterised in that the extruders for the sealing hose and the clamping strip are arranged laterally to the injection head, whilst the feed ducts, with which the cross-sectional reduction is produced, extend in a fairly large or a larger portion of the injection head.

4. A device as claimed in claim 2 or 3, characterised in that the extruder for the material of the sealing lips is connected, in the region of the front portion of the mouthpiece of the injection head, to this.

5. A device as claimed in claim 4, characterised in that the extruder for the material of the sealing lips is connected to the front end of the mouthpiece, in which respect the mouthpiece is provided with a feed duct which is deflected through about 180°, so that the material emerges in the connection direction once more from the mouthpiece.

6. A device as claimed in claim 4, characterised in that the connection of the extruder for the material of the sealing lips is displaced back on the mouthpiece, so that it lies approximately perpendicularly to the axis of the mouthpiece.

7. A device as claimed in claim 6, characterised in that the extruder which feeds the material for the sealing lips is arranged perpendicularly.

8. A device for producing sealing strips substantially as hereinbefore described with reference to and as illustrated in Fig. 2 of the accompanying drawings.

9. A method of producing sealing strips substantially as hereinbefore described with reference to the accompanying drawings.

10. A sealing strip produced in accordance with the method and device substantially as hereinbefore described and as illustrated in Fig. 1 of the accompanying drawings.

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