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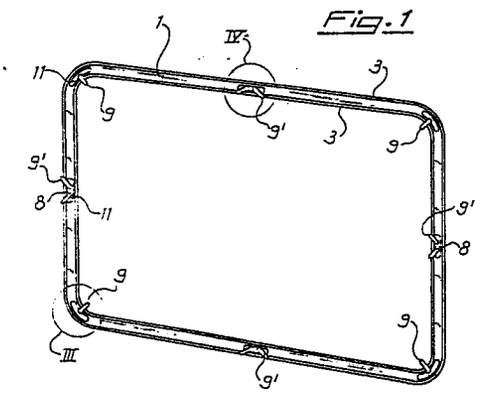
(54) **Improved gasket of elastomer material in the form of a closed or open frame for cooking oven doors.**

(57) A frame gasket is described for cooking oven doors, which comprises a tubular profile (1) with inner longitudinal cavity (2) and peripheral flange (3), having only one butt joint, if any, even if the frame is of the four-side closed type. Coupling metal inserts are provided for engagement into associate holes (12, 13) of the abutment surface (14) about an over opening. In a first embodiment said inserts are either L-shaped (5, 6), possibly of asymmetrical legs, with coupling tabs (9) for the corner bent portions of the frame, or formed as elongated metal plates (8) with spring-like prongs (9′) for engagement into holes (13) of the rectilinear lengths. These prongs (9′) and the coupling tabs protrude from the profile through slots (11) formed by removal of material. In a second embodiment the metal inserts (20) are all identical, formed of a longitudinal plate length (21) to be fitted into the cavity (2) and fonded at an end thereof with a hooked tab (22) projecting outwardly through a hole (27) of the profile, there being provided two of said insert members (20) at each corner region (25, 25′) and one of them at each free end of the frame when it is open with three sides.

Fig. 1




EP 0 277 098 A2

**Description**

# IMPROVED GASKET OF ELASTOMER MATERIAL IN THE FORM OF A CLOSED OR OPEN FRAME FOR COOKING OVEN DOORS

The present invention relates to an improved gasket of elastomer material to be particularly used between a cooking oven opening and the associate door, being in the form of a three-side open frame or of a four-side closed frame.

Various types of gaskets in elastomer material are known for cooking ovens, formed of three-side or four-side frames applied to the oven front portion which provides for a shoulder abutment against the associate door when closed. Sometimes the lower side may be missing, at the zone where both the vapour leakage and the heat loss are smaller.

These gaskets may be integrally moulded, with corners already formed, but at so high costs that cannot be accepted by oven manufacturers.

Less expensive are the frame-type gaskets formed of three or four separate pieces, one for each side, which however show discontinuity at the corners where the vapour leakage and heat losses are considerable. Furthermore their assembly may be rather difficult, especially when these gaskets are embedded in the sheet iron from which they partially protrude to the outside, during the preassembly step.

It is true that frame-type gaskets have been recently provided in which the continuity at the corners is ensured by means of resilient metal prongs to be inserted into corresponding holes on the oven front portion, both at the corner zones and if necessary also along the longitudinal sides. Problems of mechanical breakage are however present due to the thermal expansions of the prong metal engaging the elastomer material under a certain stress. According to the Italian Utility Model Application No. 20850 B/82 a continuous gasket is also known having shaped and spaced apart plugs of the same material, integrally formed for fitting into suitable slots provided in the sheet iron. In this case the seal tightness is certainly good, but a heavy employment of labour is required for fitting into the slot. Furthermore other solutions, although provide for a good tightness and not excessively high costs, do not guarantee the gasket being fastened in a perpendicular direction to the abutment surface.

Therefore it is an object of the present invention to provide a gasket of the above-mentioned type, which is radiused near the corners by metal coupling, possibly asymmetric L-shaped inserts, but preferably all of the same shape as of an elongated plate suitable to be very easily and readily mounted onto plane surfaces provided with spaced apart holes, by means of coupling points preferably located at the bent joint zones with possible additional fastening points generally located along the rectilinear lenghts of the gasket to obtain a positive peripheral sealing.

The gasket of the invention, formed of a tubular profile, particularly of silicone rubber, having a continuous, frontally protruding peripheral flange, with a possible single butt joint, is characterized by metal coupling inserts for engagement under stretch in associate holes provided at the abutment surface, said coupling inserts being located at the inside of the tubular profile from which they project outwardly, possibly through slots formed by material removal at the rear side of said profile, with hooked tabs or protruding resilient prongs.

According to a particular aspect of the present invention, whenever the butt joint has been carried out in proximity of a frame corner, the corresponding L-shaped coupling insert has asymmetric legs, with the longer one provided at the junction side, and in this case, to ensure the gasket being fastened also orthogonally to the abutment surface, said inserts are formed of rectilinear plates, provided with spring-like elements for engagement into said holes and passing through said slots.

According to still another aspect of the invention, when the gasket has only three sides, each one of the free ends is fixed to the abutment surface by means of coupling inserts which longitudinally project from the inside of the tubular profile.

Finally, according to a preferred embodiment, said insert members are all of the same type, whichever is their position along the gasket, being formed of an elongated plate to be inserted within the tubular profile and provided at one end with a hooked tab projecting to the outside of the profile. In this case the accommodation of the profile at the corner zones will be simply obtained, when mounting the gasket frame, by properly positioning a coupling insert member at both the ends of the bent portion, thus leaving that the profile freely disposes itself along the most convenient pattern and the consequent bending radius without any strain.

These and other objects, advantages and characteristics of the sealing frame according to the invention will clearly result from the detailed following description with reference to the drawings in which:

FIGURE 1 shows a perspective view of a closed four-sided gasket frame according to the invention;

FIGURE 2 shows another perspective view of an open three-sided frame of the invention;

FIGURE 3 shows more in detail the particular III of Fig. 1, wherein the butt joint of the profile is near to a corner bent portion;

FIGURES 3a, 3b show two embodiments of a L-shaped insert member for a radiused corner zone, wherein the one of Fig. 3b is of the type illustrated in Fig. 3 with the junction in proximity of the corner;

FIGURE 4 shows in detail the particular IV of Fig. 1 at an intermediate engagement zone along a rectilinear side of the frame;

FIGURES 4a, 4b respectively show the spring-like prong insert and a portion of tubular profile of the frame with slot for the fitting of said insert;

FIGURES 5, 5a respectively show in greater detail the particular V of Fig. 2 and the associate coupling insert only;

FIGURE 6 shows an oven opening with the stationary portion on which the sealing frame has to be mounted and the oven door at an open position;

FIGURE 7 shows a perspective, partially cross-sectional view of a three-side open frame gasket according to a preferred embodiment of the invention;

FIGURE 8 shows a perspective view of a frame length, of the four-side closed type at a junction zone in proximity of a corner; and

FIGURE 9 shows a perspective view of one of the coupling insert members used according to the above-mentioned preferred embodiment.

With reference to Figs 1-6 a tubular element 1 of elastomer material, preferably silicone rubber, is provided in a known manner with an inner longitudinal cavity 2 and a protruding V-angled flange 4 integrally formed by extrusion. According to a particular embodiment of the present invention at the side opposite to the flange 4 two parallel longitudinal ribs 3 are preferably provided having the purpose of ensuring a more efficient tightness of the gasket onto the surface of the stationary abutment zone, particularly the front portion of an oven 14 as represented in Fig. 6, while flange 4 is useful for the sealing with the mobile portion surface, particularly the oven door 15. The flange 4 will be directed no matter either to be convergent torwards the oven inside or diverging outwardly. In the first instance a better tightness will be obtained as the flange works under pressure, while in the second one the gasket can be considered as "self-cleaning", since the upper side has the function of a gutter to prevent possible dirty or fluids from entering the sealed opening, and the lower side, if any, has the opposite function of helping possible dirty or fluids to drops therefrom.

As the gasket frame is formed of a single profile joined at any point whichever along its perimeter there is no discontinuity of the sealing at the critical areas located at the bent corners.

The gasket frame is fastened to the surface 14 by means of metal inserts or fits of various type, all provided with a protruding coupling member 9 to be fitted into associate holes 12, 13 formed in the abutment surface 14. A profile stretch, of resilient character, which is preferably established, is obtained by properly arranging the center to center distance between holes 12 of the corner zones and 13 along the longitudinal portions, and designing slightly shorter such a distance at the locations corresponding to the frame fastening. This stretch can be different from a length to another according to the distance between the fastening points, their placement and orientation.

Therefore there are corner-radiusing insert members 5 which are L-shaped (see Fig. 3a) and provided with hook 9 for fitting in holes 12, and metal plate inserts 8 with spring-like elements 9′ for insertion in holes 13. Both these shapes of insert member are accommodated into the tubular profile 1 through slots 11 formed by removal of material on the side of the profile opposite to flange 4, at the planar area comprised between the two possible longitudinal ribs 3. The distance between slots 11 is a function of the space between holes 12, 13 and the desired stretch, as stated above. Their shape will be such as to allow the stretched fitting of the inserts when considering the resilient mechanical features of the elastomer material adopted and the size of the members themselves to be inserted. A slight shrinkage of the tubular cross-section, due to stretching, causes an increase of interference between elastomer and metal parts, thus ensuring the mutual fastening thereof in case of particularly severe applications. For a greater safety the metallic parts could be bonded to the profile by a suitable adhesive.

As stated before, the butt joint to have the closed profile of Fig. 1 may be formed at any location and, if in proximity of a corner, according to the invention a bent member 6 (Fig. 3b) with an elongated leg is advantageously used. As seen in Fig. 3 the longer leg of insert member 6 projects from one end of the profile to which the other end is joined for causing the frame to close itself. Bonding is provided by a suitable adhesive, especially silicone-based, as well as by the metal insert being fitted to the profile inner walls, and mechanical resistance resulting from the portion of adhesive mass polymerized in the gaps formed between some notches 10 which are provided on the longer leg of member 6 and the inner walls of profile.

Consequently, the radiused corners of the frame and fastening at these zones are provided by insert members 5, 6 which at the same time give the profile an adeguate stretch along its axial direction, and the gasket fastening also orthogonally to the abutment surface 14 is provided by the rectilinear metal inserts 8 which are also fitted into the slots 11 formed on the rear side of the profile (see Figs. 4, 4a, 4b).

The open-shaped or three-side frame (Fig. 2) is obtained making similarly use of only two bent coupling inserts 5, of two insert members 8 (Figs. 5, 5a) and possibly, to improve the fastening in a perpendicular direction, of some members 8. The coupling insert 7 is fitted with its elongated portion into cavity 2 of the tubular profile 1 from which it protrudes with a hooked tab 9a which, contrary to the coupling hooks 9 associate to members 5 and 6, extends longitudinally while remaining on the same plane of the insert member with no need of slots 11.

As it results from the foregoing description, at least three different types of metal inserts are required, all provvided with a protruding engagement element capable of fitting into corresponding holes of the abutment surface. Furthermore, for a good accommodation of the profile in the vicinity of the comers, it is important that the L-shaped metal inserts have a bending radius coincident with the one required for the profile. All this involves supplying and storing metal pieces of various shapes, in addition to relatively critical processes, having as a consequence an increase of the gasket manufacturing costs.

According to a preferred embodiment only one shape of metal coupling inserts may be required, without any need of forming on the tubular profile elongated slots by means of material removal, but only holes for passing therethrough the protruding flanges of these inserts.

With reference to Figs. 7-9 a tubular gasket frame 1 of the type illustrated in the preceding figures is fastened at its position by means of metal insert members 209, one of which is shown in Fig. 9, all identical irrespective of the location, along a longitudinal or corner length, occupied on the gasket.

With reference to a three-side open frame (Fig. 7), two end insert members 20 are respectively fitted at the two open ends of profile 1 by threading elongated plate 21 into cavity 2 of the profile, from which a hooked tab 22 protrudes outwardly for engagement into associate holes provided about the oven opening.

In proximity of each of the two corner regions 25, 25′ it is sufficient to fit two insert members into the respective radiusing portions of connection to the horizontal and vertical rectilinear portion of profile 1, in order that the latter freely arranges at the corner region with the most appropriate bending radius, without any strain. To this purpose, for each pair of inserts 20 designed to define a corner zone 25, 25′, the rectilinear plate portion 21 will be inserted within the profile 1, thus being housed in the cavity 2 passing through a suitable hole 27, so that the hooked portion 22 will be adjacent to the bent portion of the frame and defines only those locations thereof which are of radiused connection with the longitudinal portions and will be fastened to the respective holes on the sheet iron.

With reference to Fig. 8 one can observe that in case of a four-side closed frame, this arrangement based on use of pairs of insert members in proximity of the corner regions will be repeated for each of the four corners without particular problems or the need to resort to different insert types, even whereven a butt joint is provided like shown at 28. The longitudinal portion 21 of member 20 ensures continuity in this zone by "welding" together the two ends of tubular profile, which will be of course mutually fixed by means of a suitable adhesive.

It should be appreciated that this gasket embodiment provides the additional, important advantage that it can be mounted with flange 3 directed no matter whether towards inside or outside of the oven, at choice of the user, without any restriction as to the radius or bending pattern at the corners. It has been observed that at the corner zones the gasket follows the desired curve pattern in an absolutely free manner with the only limitation given by the flexibility degree of the tubular profile 1.

Finally it will be noted that, both in case of closed frame and of open frame, as well as in all embodiments of the insert members, the tensioning of the free lengths of profile 1 will be suitably calculated in order to ensure a correct operation of the gasket within the temperature range required, without any deformation or bowing.

As it will be seen from the foregoing description, the frame gasket is of a single piece and there is only one butt joint with possible rubber-metal contact. Finally this gasket can be easily and readily mounted, as well as removed from its seat with likewise easiness and rapidity to be cleaned, thus ensuring very good hygienic conditions in addition to an ever efficient tightness.

## Claims

1. A frame-like gasket of elastomer material, particularly for cooking oven doors, formed of a tubular profile (1) with inner longitudinal cavity (2) and having a continuous, frontally protruding peripheral flange (3), with only one butt joint, if any, characterized by metal coupling inserts (5, 6, 7, 8, 20) for engagement under stretch in associate holes (12, 13) provided at an abutment surface (14) of sheet iron, said coupling inserts being located at the inside of the tubular profile (1) from which they project outwardly, partially through slots or holes (11, 27) with hooked tabs (9, 9a, 22) or resilient prongs (9′).

2. A gasket according to claim 1, wherein said metal inserts (5, 6) have coupling tabs (9) protruding from said slots (11) in proximity of the corner zones of said frame for fitting into holes (12) of the sheet iron surface (14), and have a radiused L-shape.

3. A gasket according to claim 2, wherein said L-shaped inserts (6) have two legs of different length, asymmetrical with respect to the tab (9) for engagement at corner regions in whose vicinity a butt joint is provided, the longer leg of said insert (6) being along the junction side.

4. A gasket according to one of the claims 2 or 3, wherein said metal insert members (8) interposed between said corner inserts (5, 6) for fastening in a direction perpendicular to the abutment surface (14), are comprised of an elongated metal plate and sping-like prongs (9′) to be fitted into said holes (13).

5. A gasket according to claim 1, formed of only three-sides of profile (1) without any butt joint, wherein each one of the two free ends of said profile is fastened to the abutment surface (14) by means of coupling inserts (7, 20) longitudinally protruding from the inside (2) of the tubular profile (1) and provided with longitudinally extending hooked tabs (9a, 22).

6. A gasket according to whichever of the preceding claims wherein said slots (11) are obtained by removal of material at the rear portion of profile (1).

7. A gasket according to at least one of the preceding claims, wherein the rear side of profile (1), opposite to said sealing flange (4) has two longitudinal parallel ribs (3) laterally defining a strip of profile (1) where said slots (11) are formed.

8. A gasket according to claim 1, characterized by metal coupling inserts (20) all of the same type at any location along the gasket,

formed of an elongated plate (21) length to be fitted within cavity (2) and provided at an end thereof with a hooked tab (22) protruding outwardly of the profile (1).

9. A gasket according to claim 8, characterized by the fact that, at each corner region (25, 25′) of the frame, two insert members (20) are arranged to define the locations of radiused connection between bent and rectilinear portions, each of them being inserted with its tab (22) directed toward the corresponding corner region (25, 25′) and outwardly projecting through a hole (27) formed in the profile (1) entering the rectilinear length (21) of said insert member (20).

10. A gasket according to claim 5 or 9, of the three-side open frame type, characterized by at least six of said metal inserts (20), two of which are provided at the two free ends of the frame and the other four, in pairs, in proximity of the two corner zones (25, 25′).

11. A gasket according to claim 9, of the four-side closed frame type, characterized by at least eight of said insert members (20), located in pairs at each one of the four corner zones, wherein a butt joint (28) is provided to close end to end the profile (1) like a ring at a rectilinear portion (21) of an insert (20) in proximity of a corner region (25, 25′).

Fig.1

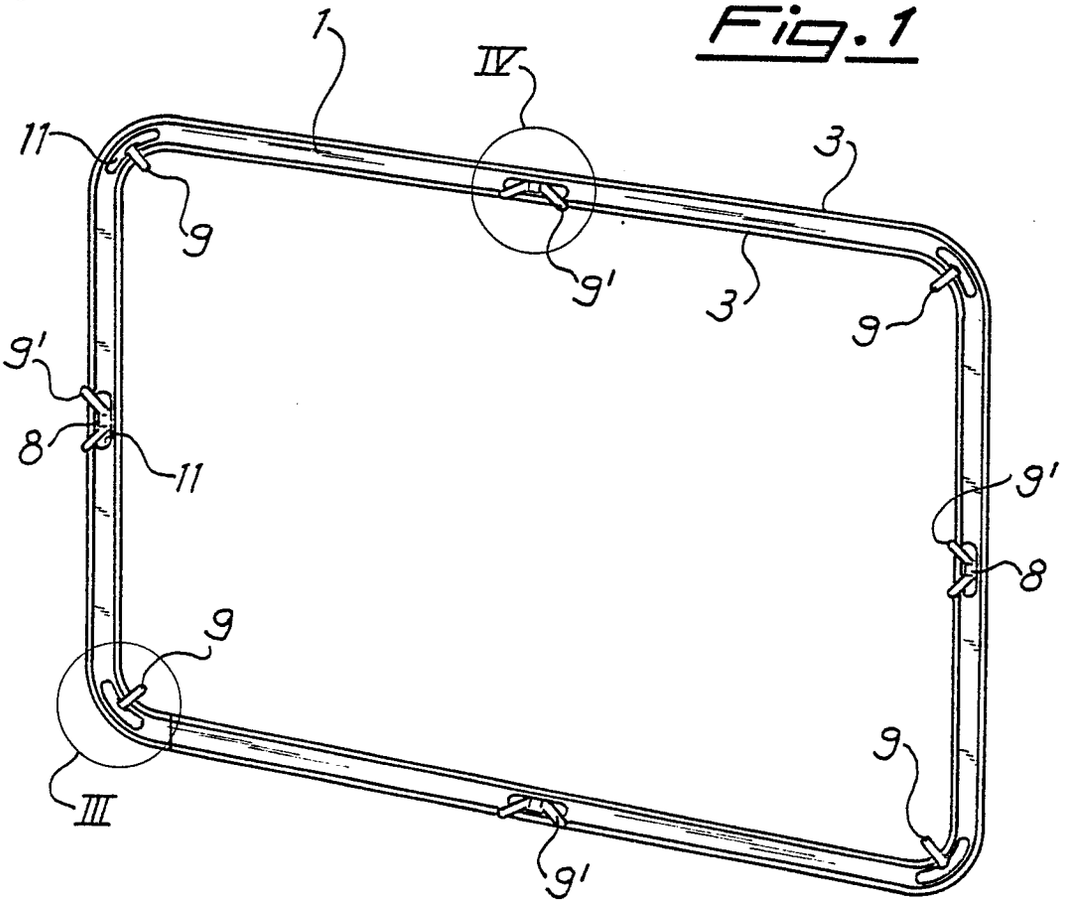



Fig.2

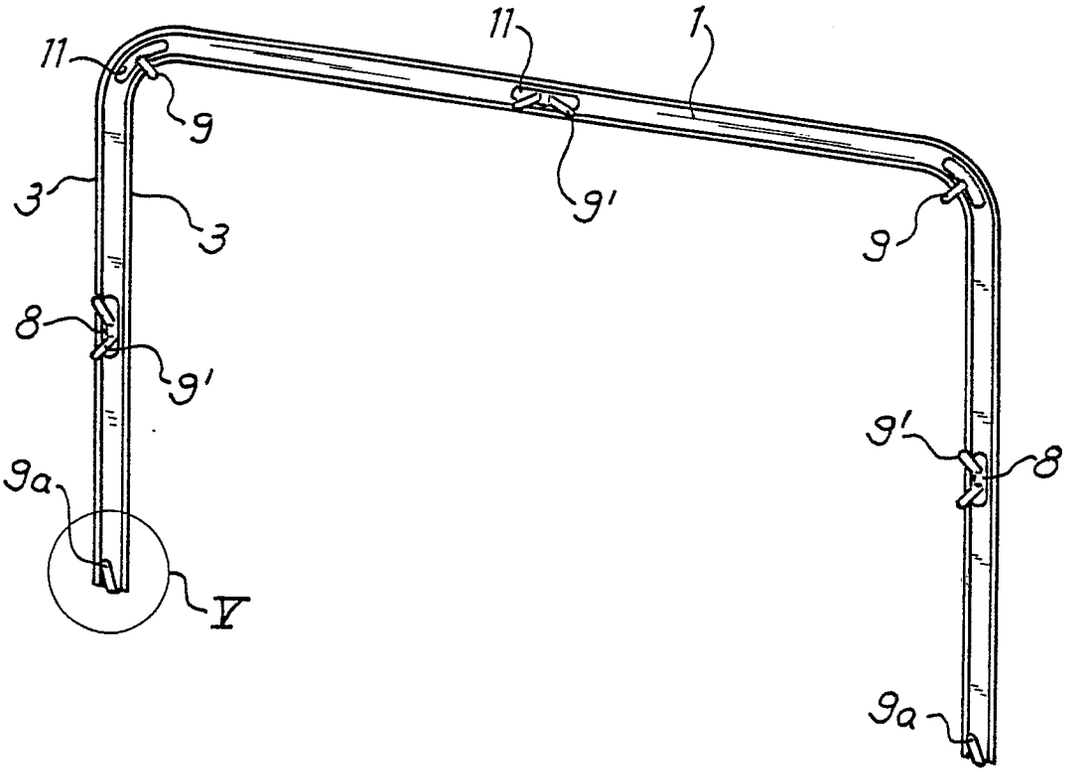


Fig.3

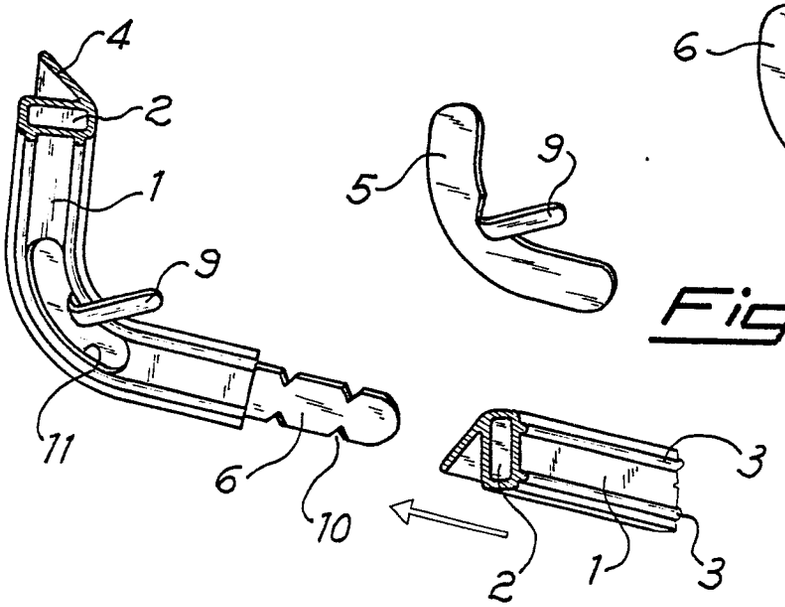



Fig.3b

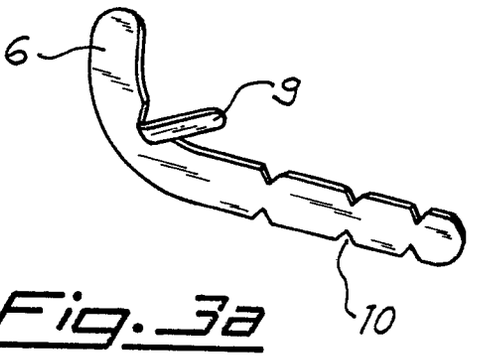



Fig.3a




Fig.4

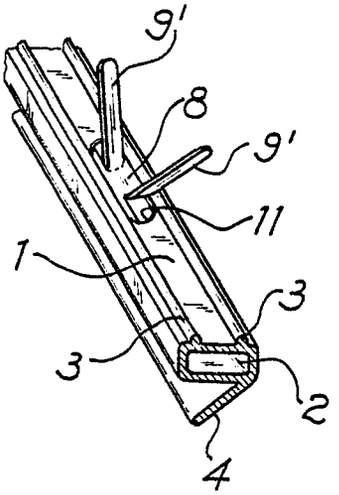



Fig.4a

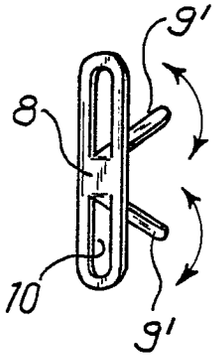



Fig.4b

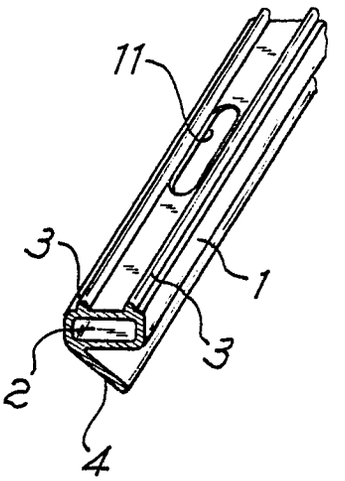



Fig.5

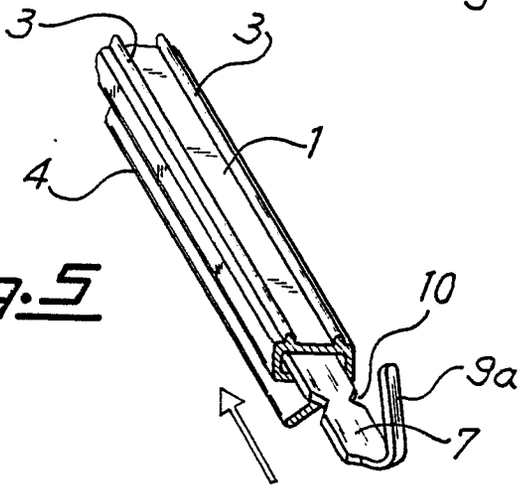



Fig.5a

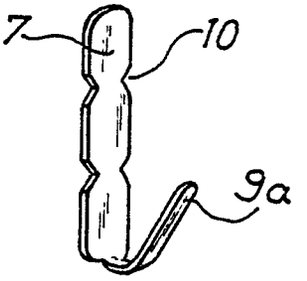


Fig.6

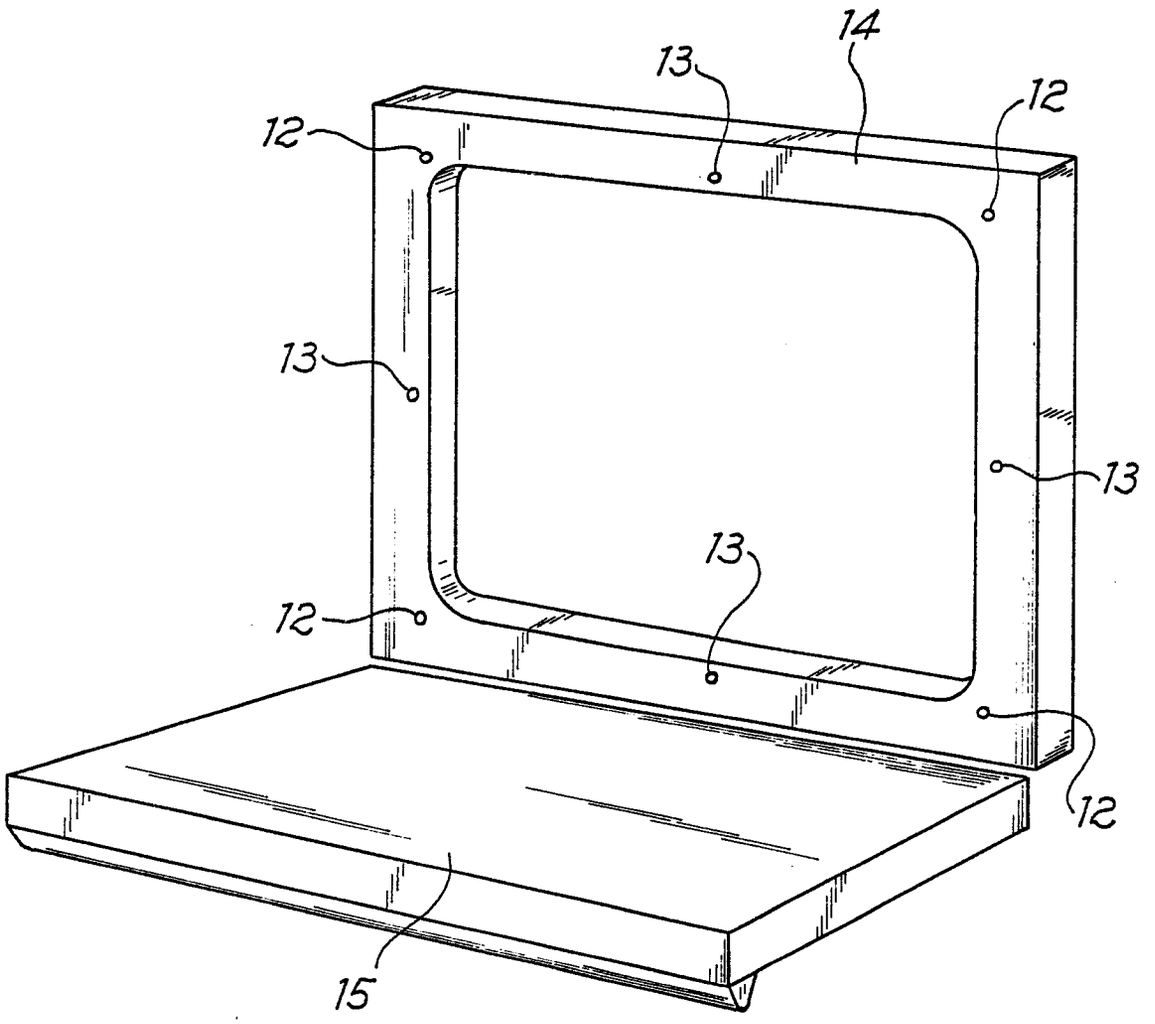


Fig. 7

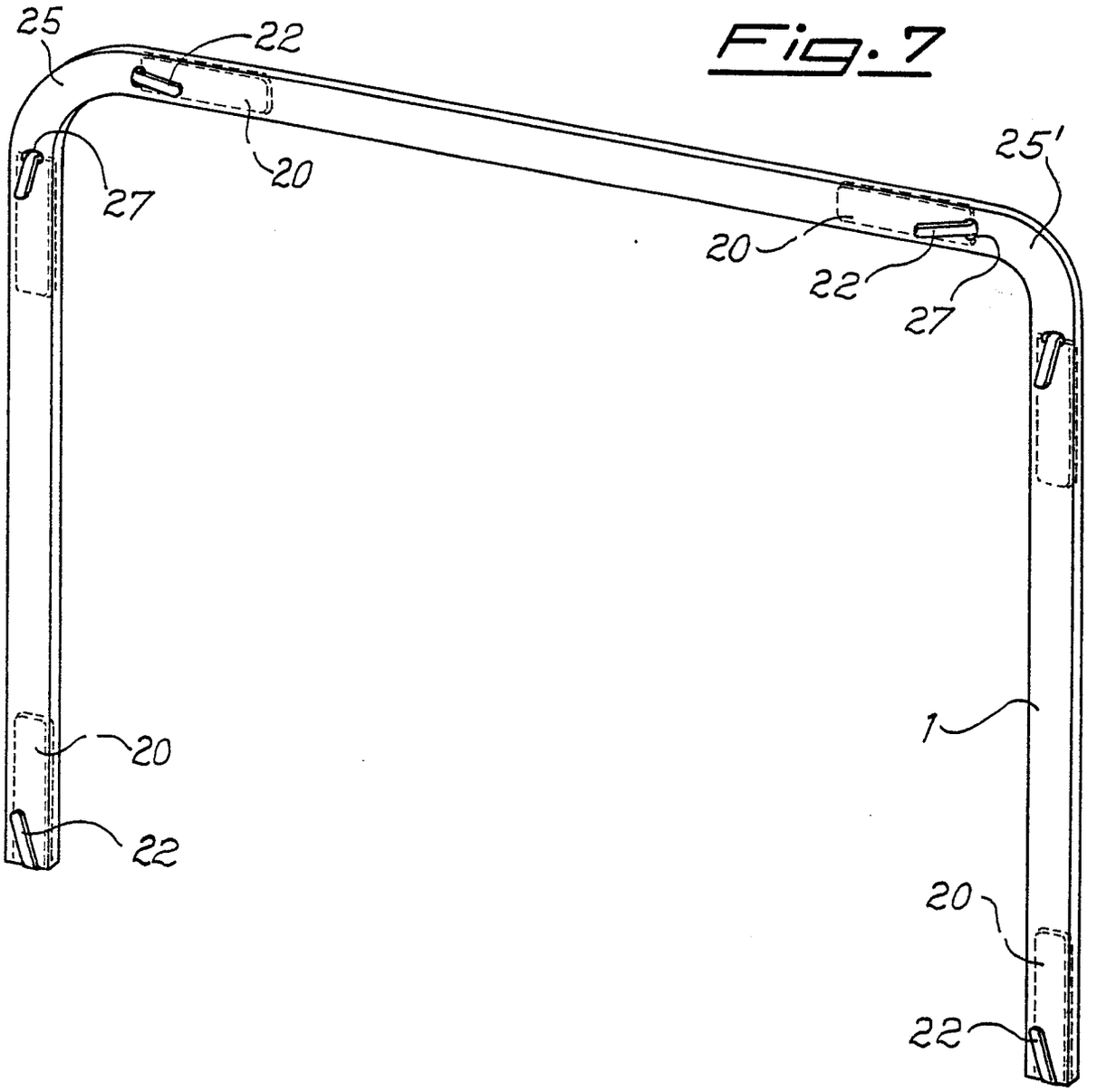



Fig. 9

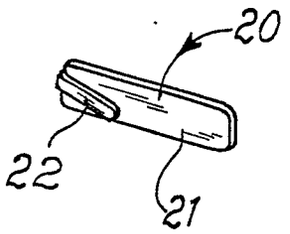



Fig. 8