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(54) Improved garage door.

(57) An improved garage door, devised for manufacture on a large scale with a significant reduction in energy requirements and/or materials consumption as compared with doors made by many existing methods, is in the form of a generally rectangular metal from (10) and one or more metal panels (12) located in the frame. The panels (12) are secured to each other and/or to the frame (10) by a multiplicity of connections (14) at intervals along their abutting lengths and each connection (14) takes the form of a localised non-piercing stretching of the two metal components into a laterally-enlarged protrusion (20, 21 ; 26, 27) wich holds the two components together.

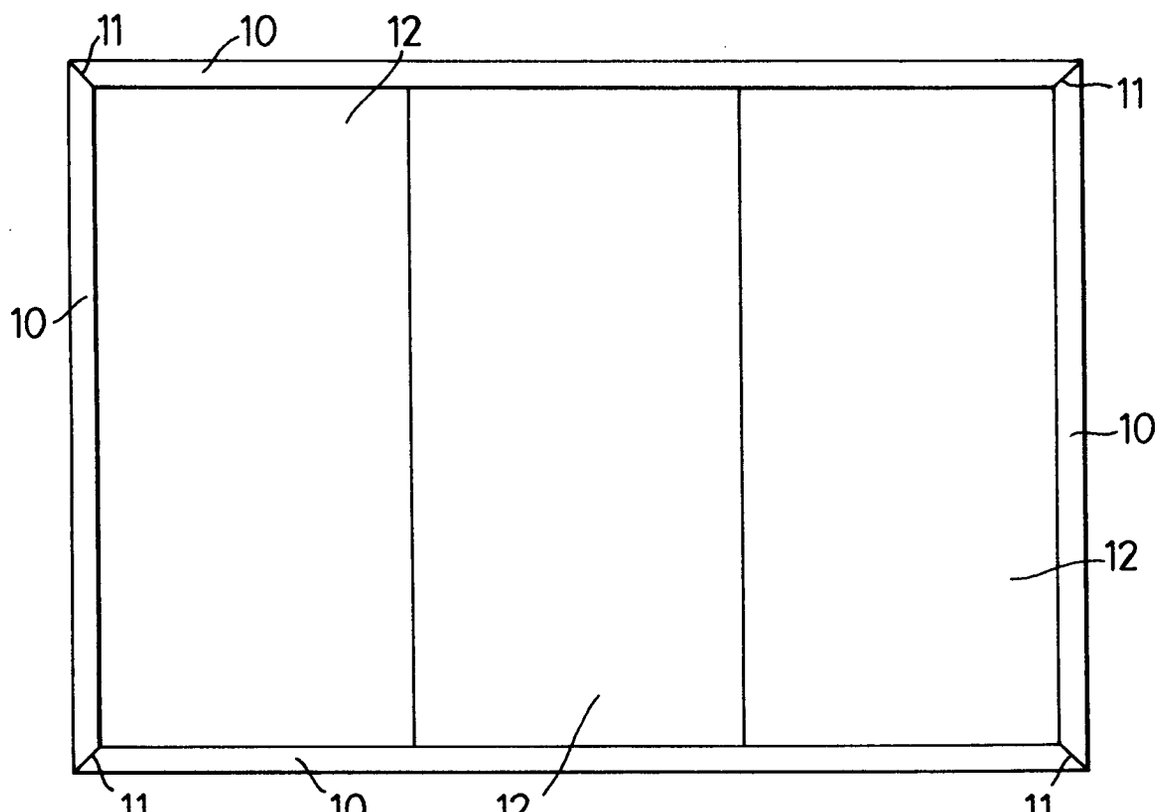

Fig. 1

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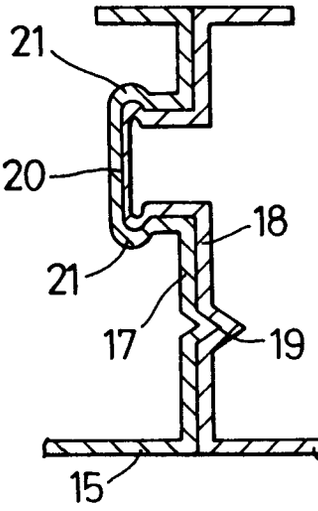

Fig. 3

The present invention relates to garage doors, especially, but not exclusively, of the so-called "up-and-over" type which are widely used for domestic garages.

A large majority of such doors as are now available are constructed in the form of a generally rectangular frame into which one or more panels are secured. The frame is of metal and, although in some cases timber panels are used, a high proportion of these doors use panels fashioned from pressed steel sheet. This form of construction has the important advantage that it is readily adapted to the production of doors of a range of different sizes from a minimum number of different components. However the large-scale manufacture of doors of this type is a major consumer of resourses and/or manpower in the securing together of the components of the doors.

One approach to the production of doors of this type is to secure the metal panels to each other and to the door frame by spot-welding at intervals along the abutting surfaces. However, in a typical single door constructed from, say, five narrow panels and wherein the welds are spaced at intervals of the order of 8 to 10 cm, there are as many as 200 spot welds required. Since welding in this way not only entails heating the components in the region of the welds to a suitably high temperature but also then requires a water-based cooling system to remove the heat, this method of constructing metal-panelled garage doors consumes large quantities of energy. Unless the welding operation is highly automated, the manpower requirement is also high.

An alternative prior approach has been to assemble the doors by securing the components together using rivets, studs or similar fasteners. However, as with welding, it is necessary to make the connections at relatively close spacing. Thus assembling doors by riveting in this way requires large numbers of rivets and therefore contributes significantly to the costs of large-scale production.

It is therefore an object of the present invention to provide an improved garage door, which can be produced with a considerable saving of consumable resources of energy and/or materials as compared with existing doors.

The improved garage door according to the invention comprises a generally rectangular metal frame and one or more metal panels located within the frame, the panels being secured to each other and/or to the frame by a multiplicity of connections at intervals along the abutting lengths of the panels or frame, each connection comprising a localised non-piercing stretching of the two metal components into a laterally-larged protrusion which holds the two components together.

The door is of the type having a generally regular metal frame having one or more metal panels located in the frame. Doors of this general type are well known. The frame in the present case is preferably constructed from steel sections welded and/or riveted together at the corners but by virtue of the form of connections defined above, the need for welding or rivetting in other constructional connections in the door structure may be avoided. The invention is applicable to any door having a metal frame and one or more metal panels but is of particular merit when applied to a metal-panelled door of the type which is a subject of co-pending EuropeanPatent Application No. 91303686. 9, filed 24th April 1991.

The metal panel or panels of the door of the present invention may be mounted in the frame with their longer axes vertical or horizontal (relative to the door in its closed position). In general, panels of this type have flanges running continuously along at least the longer sides of the panels and it is these flanges by which adjacent panels are usually secured together and to the adjacent door frame. In the case of the present invention, it is preferably such side-flanges on the door panels which are connected together and/or to the door frame by the form of connections defined above.

Connections of this type are known in themselves in the domestic appliance and automotive industries but to the best of our knowledge have not heretofore been recognised to be of value in the very different context of forming part of the structural strength of a panelled garage door. Not only has it now been established to our satisfaction that such connections very adequately fulfil that function in a door as described; a direct consequenoe of the use of such connections is that they lead to a major saving of resources in terms of welding requirements or rivets.

Each connection is formed by stretching the two abutting metal components in the region of the intended correction, sufficiently to press the metal out of the plane of abutment without piercing the metal surface. A protrusion is thus formed which is then enlarged laterally (that is, parallel to the plane of abutment) with the result that the two components are thereby securely held together. One form of apparatus for forming such joints has been described in United Kingdom Patent Specifications Nos. 2087284, 2123734 and 2189175, all in the name of BTM Corporation. That form of connection is identified by the trade mark "Tog-L-Loc" of that company. Another form of connection of this general type is that provided by Pressotechnik GmbH under the trade mark TOX.

The connections may be used to secure togetber adjacent door panels, or to secure one or more panels to the door frame, or preferably for both of these purposes. The spacing-apart of the connections is selected according to other details of the door design and weight but typically such connections are made at a pitch in the region of 5 to 20 cm, preferably within the range from 7 to 10 cm.

The invention will now be further described, by way of example only, with reference to the accompanying drawings, which illustrate one preferred embodiment of a garage door according to the present invention and wherein:-

Fig. 1 is an elevation from the front of the garage door;

Fig. 2 is a horizontal sectional view of the door of Fig. 1;

Fig. 3 is a detailed sectional view to a larger scale of a connection between adjacent panels of the door of Figs. 1 and 2; and

Fig. 4 is a detailed sectional view of an alternative form of connection between adjacent panels.

The garage door shown simply in Figs. 1 and 2 comprises a frame formed from four double-box-section steel members 10, welded together at their abutting ends 11 to form a generally rectangular door chassis. Secured within the frame behind a peripheral flange on the members 10 are three pressed-steel panels 12, each formed with a flange 13 around its sides and ends. The panels 12 are shown plain in the drawings but will in practice normally have longitudinal ribs or other pressed features giving a mesure of additional rigidity and if desired decoration to the panel. Adjacent panels are connected together and also to the chassis members 10 by connections 14 indicated diagrammatically in Fig. 2. These connections are spaced uniformly around the peripheries of the panels 12 at an interval of the order of 8 cm.

Fig. 3 shows, to a much larger scale, one form of the connectors 14, formed in this case by a "Tog-L-Loc" machine supplied by BTM Corporation. As illustrated in that figure, two pressed-steel panels, identified by the reference numerals 15 and 16, have flanges 17 and 18 respectively running continuously along their mutually adjacent sides. The flanges in the illustrated embodiment have mating ribs 19 running their full length to assist in locating the panels in accurate alignment and also to form a weather-proof seal between the panels. By means of a "Tog-L-Loc" machine, the two flanges 17, 18 are stretched and deformed locally to form a protrusion 20 which extends laterally at 21 so as to hold the two flanges together without penetrating the metal of the flanges.

Fig. 4 illustrates an alternative, somewhat similar connector formed by pressing using the TOX (trade mark) system available from Pressotechnik GmbH. In that connector, the metal of two flanges 22 and 23 on panels 24, 25 is again distorted locally with the result that mating protrusions 26 and 27 on the flanges hold the two panels securely together.

While in connecting together two panels, as illustrated in Figs. 3 and 4, only two layers of metal are stretched to form the connector, if one of the components to be connected, for example the double-box section frame member 10, is of double thickness at the point of connection, the connector may be formed in a similar way simply by stretching the three superimposed layers of metal.

It will be apparent that the improved door according to the invention, for example in the embodiment illustrated in the accompanying drawings, may be manufactured on a large scale with a substantial reduction in energy requirements and/or materials consumption as compared with prior metal panelled doors assembled by welding and/or rivetting, while maintaining the important standards of quality and strength which are desirable in doors of this general type.

Claims

1. An improved garage door which comprises a generally rectangular metal frame (10) and one or more metal panels (12) located within the frame, the panels being secured to each other and/or to the frame by a multiplicity of connections (14) at intervals along the abutting lengths of the panel or frame, characterised in that each connection (14) comprises a localised non-piercing stretching of the two metal components (10, 12) into a laterally-enlarged protrusion (20, 21; 26, 27), which holds the two components together.

2. A garage door according to claim 1, characterised in that the generally rectangular frame is constructed from steel sections (10) welded and/or rivetted together at the corners of the frame.

3. A garage door according to claim 2, characterised in that the frame is constructed from double-box section frame members (10).

4. A garage door according to any of the preceding claims, characterised in that it comprises at least two said metal panels (15, 16; 24, 25), each having flanges (17, 18; 22, 23) running continuously along at least a pair of longer sides thereof, abutting flanges on adjacent panels being secured together by said connections (14).

5. A garage door according to any of the preceding claims, characterised in that said connections (14) are made at an interval in the region of 5 to 20 cm.

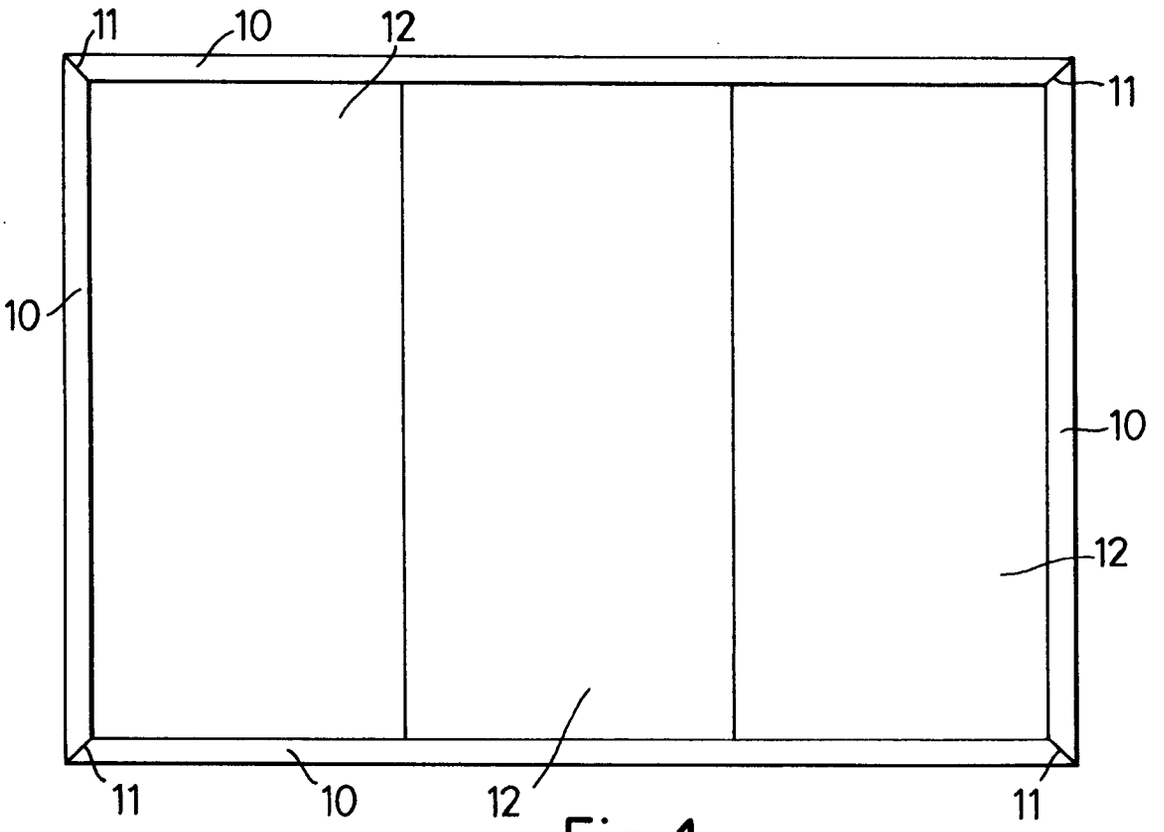

Fig. 1

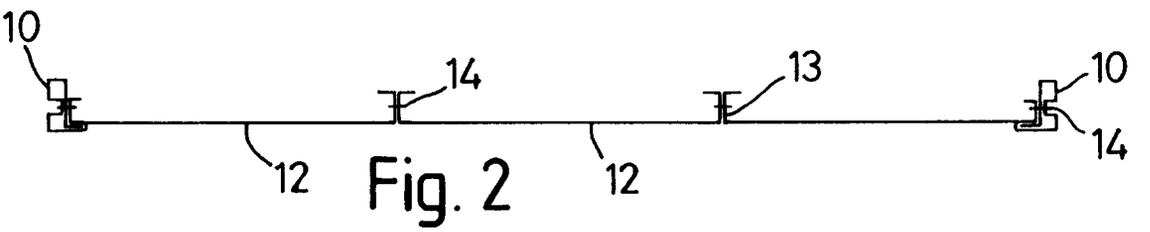

Fig. 2

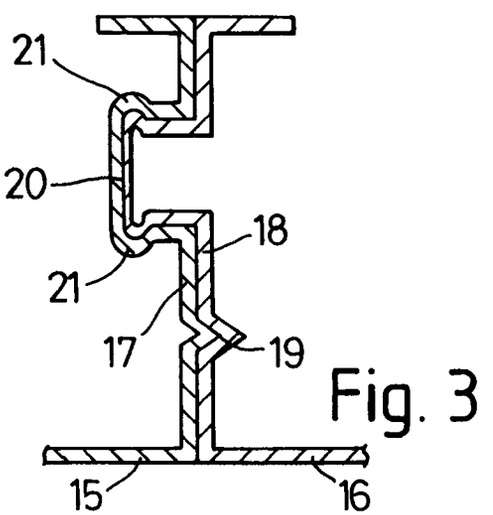

Fig. 3

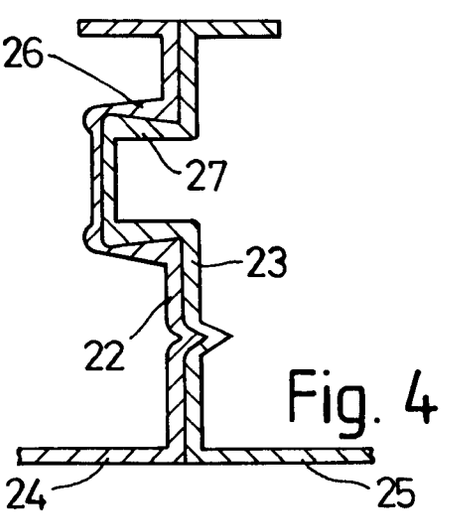

Fig. 4