

PATENT SPECIFICATION

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- (21) Application No. 18647/77 (22) Filed 4 May 1977
(31) Convention Application No's.
7 613 881 (32) Filed 5 May 1976
7 629 987 30 Sept. 1976
7 706 548 1 March 1977 in
(33) France (FR)
(44) Complete Specification published 31 Dec. 1980
(51) INT. CL.³ A63B 49/02
(52) Index at acceptance
A6D 21B 21C 25A 25B



(54) RACKET FRAME FOR BALL GAMES

(71) I, PAUL LAFOURCADE, of French Nationality, of 23 rue de la Paix, Barbazan Debats, 65 600 Semeac, France, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be described in and by the following statement:—

The subject matter of the present invention is a racket frame for ball games, for example a tennis racket frame.

The invention aims at providing a frame of the type mentioned above from a section, e.g. made of metal produced by extrusion, which is shaped into a loop to form the rounded head which has two branches forming the frame of the handle.

The invention aims at obtaining, with a minimum number of manufacturing operations, an excellent quality frame which combines the advantages of the metal section both in regard to manufacture and strength, with the advantages of synthetic materials such as synthetic fibres and/or resins in regard to weight reduction and play qualities.

The invention furthermore aims at providing a racket frame for ball games in which the association of the section with the synthetic material(s) is easy to achieve and durable, which reduces the number of manufacturing operations and the cost of the product.

According to the invention there is provided a frame, for a racket for ball games, comprising an elongated hollow member of which a central portion is shaped into a partial loop to form part of the head of the racket and of which two end portions are placed in parallel spaced relationship and incorporated into a handle of the frame, a hollow central bow separately formed from the hollow member and having two ends each of which is secured to the hollow member where a respective end portion

merges into the central portion, said central bow and the partial loop together providing a closed loop intended to carry the usual stringing of the racket, the elongated hollow member being apertured in its wall at each location where the central bow is secured to it such that the interior space of the hollow member is in communication with the interior space of the central bow, said apertures having a length in the longitudinal direction of the elongated hollow member not less than the distance between the inside shapes of the inner and outer walls of the elongated hollow member, the interior space of the hollow member and the interior space of the central bow having therein a continuous filling of a reinforcing material.

Moreover, the moulding into the section and the central bow of a synthetic product contributes greatly to eliminating the vibrations which are so frequent in metal rackets at the time of impact, this moulding being facilitated by the shaping of the section.

In the accompanying drawings:

FIGURE 1 shows an elevation view of the racket frame according to the invention;

FIGURE 2 shows a longitudinal section of Figure 1,

FIGURES 3, 4, 5 and 6 show sectional views of the different sections used,

FIGURE 7 shows a central bow designed to complete the rounded head;

FIGURE 8 shows the cooperation of the section and the central bow according to Figure 7,

FIGURES 9 and 10 show the different types of braces and collars used according to the different types of sections, and

FIGURE 11 shows a partially cut-away view of the gripping handle.

As shown in Figures 1 and 2, the frame for a racket for ball games according to the invention is made from a section 1 in a ductile material produced by extrusion or drawing, preferably but not exclusively of metal, 90

e.g. ZYKRAL, which is shaped into a loop to form the rounded head 2 and the parallel branches 3 of the handle.

As shown in the sectional views in Figures 3, 4, 5 and 6, the section from which the racket frame according to the invention is made is a box-section hollow frame member 1 having two parallel inner and outer walls 4 and 5 integral with two side walls 6 and 7. The section, when it is being shaped to form the rounded head and the parallel branches of the handle, not shown, to simplify the description, is positioned edgewise, its section being substantially rectangular.

The wall 5 which is on the outside of the frame is set back from the sides 6 and 7 with which it is integral and it has an outer face 8 which is curved towards its transversal median axis and a flat inner face 9 which, in addition to the advantage of forming a housing for the strings and the cylindrical sheaths, makes it possible notably to increase its resistance to the pull exerted by the strings on its outside face during play.

The inner wall 4 of the frame is joined to sides 6 and 7 by two longitudinal gussets made during extrusion, which stiffen the whole of the beam to increase its torsional and bending strength.

The walls and sides of the hollow frame member such as described may be shaped so as to receive, retain and cooperate with fixed and/or removable components which help to increase the rigidity of the frame, notably in the head, and to regulate its weight, centre of gravity and inertia torque characteristics, for example.

The face of the inner wall 4 on the inside of the head is provided, on either side of its longitudinal median axis and also facing the side 6, 7 or each gusset 10, with a groove 11 and a longitudinal and parallel groove 12 which extend all around the head of the racket.

The grooves 11 and 12 are substantially circular in cross-section, their depth nevertheless being greater than the diameter of the circle formed and they are recessed, the distance between their lips being smaller than the diameter of the circle formed. The hollow frame member is thickened at the junctures of the sides and inner wall so as to accommodate the grooves 11, 12.

Each of these recessed grooves 11, 12 takes an element which fits into it by being pushed in so as to interlock.

To this end the element has a longitudinal rounded tongue 13 with part of it substantially cylindrical, the diameter of which is at least equal to that of the circle formed.

The tongue 13 serves as a means of fixing a longitudinal cap 14 which fits on to the surface of the wall 4 and helps to regulate the weight and the centre of gravity, the element being capable of being housed by

the tongue around the whole inside periphery of the frame, or on certain portions of said periphery.

The element can be made of any metal or other material which is sufficiently rigid. It is also conceivable that the element should consist of a metal wire 15, e.g. titanium, of a diameter such as has been described as suitable, as shown in each of Figures 3 and 4 by way of example. This arrangement of the invention makes it possible, in addition to the regulation of weight and centre of gravity of the racket by forcing in the element and its holding in position in the grooves by force, to pre-stress the hollow beam or compartment, which considerably increases its rigidity.

Each of the sides 6 and 7 of the section as shown in Figure 3 and Figure 4 has a longitudinal recessed cavity 16. A shown, this cavity receives a filling 17 of a composite resin-glass fibre material and/or carbon alone, preferably positioned lengthwise, said material being held in position by the recess after hot polymerisation. It is obvious that this filling 17, basically intended to increase the rigidity of the frame and its bending strength, will preferably be provided on rackets at the top end of the range, it being possible to provide a filling of other less expensive materials for rackets at the lower end of the range.

As shown in Figure 4, the section forming the racket frame according to the invention has substantially the same characteristics as the section previously described. It differs from that of Figure 3, however, in that the grooves 11 and 12 are deeper into the walls 6 and 7, and in that the stiffening gussets 10 are shaped in an arc of a circle which extends on to corresponding wings 18 of the walls 6 and 7.

The wings 18 of the flanges slant towards the longitudinal median axis of the flanges to form the longitudinal cavity 13 as described, the height of said wings being, however, sufficient for the depth of this cavity to be of the order of a few millimetres.

The cavity 16 can, as described above and as shown in Figure 3, receive a filling of an added material made of resin-carbon fibre. It can equally receive, notably in the case of rackets at the lower end of the price range, a removable added material consisting, for example, (Figure 4) of a section 19 made of synthetic material, for example RILSAN, which has a recessed shape the reverse of that of cavity 16 and which fits into it and is kept there by force, said section enabling the racket's weight characteristics to be modified.

It is possible that one of the added elements can be used alone or combined with the others, for example the longitudinal element housed in the grooves with the car-

bon fibre filling of the section may be slotted by force into said longitudinal cavity in the flanges.

As shown in Figure 3, a longitudinal filling body 20 can be inserted into the hollowed-out compartment where it will be held between the gussets 10, this body being for example a stick of a light material such as resin-impregnated balsa wood.

In Figure 6, each end of the inner wall 4 has a longitudinal boss 22 parallel to the axis of the section which forms a cavity 23. Preferably, the bosses are transversally pyramidal in shape, their respective tops being situated substantially in the extension of sides 6, 7 opposite and substantially in alignment with said flanges.

In sections shown in Figures 4, 5 and 6 the outer edges of the hollow frame member are preferably provided with a bevelled edge 24 whose effect is to reduce its resistance to air.

After the section has been shaped into a loop, and before the addition of the fibres as described, the head of the frame is completed by a central bow 25 as shown in Figures 7 and 8. The central bow consists of a one-piece unit, preferably a light alloy casting and hollowed out on the inside into a longitudinal channel 26 which communicates with the internal cavity 27 of the section forming the frame by two openings 28 opposite said channel made in the wall 4 on the inside of the section of the frame on either side of the central bow. The length of the openings in the longitudinal direction of the hollow frame member has a dimension not less than the distance between the inner and outer walls 4, 5.

The central bow is provided at each of its ends with two inside surfaces 29 on to which its cavity 26 opens, and which rest against the inner wall 4 of the hollow member.

Two parallel longitudinal ribs 30 situated on the longitudinal edges of each of the surfaces 29 and perpendicular to said surfaces engage, when assembled, within the parallel longitudinal grooves 11 and 12 of the edge of the wall 4 of the inside section of the frame, making a longitudinal joint between the section and the bow at the point most liable to torsional stresses (i.e. at the throat). The joints are strengthened by brace members 31, 32 formed integrally with said bow at each end thereof extending away from said bow and in parallel disposition to said inner walls. Rivets passing through said brace members and said the walls 4, 5 secure the bow to the hollow member.

In cross-section, the central bow is substantially a hollow beam with four sides formed by two sets of parallel surfaces which respectively brace the sides 6 and 7 and the walls 4 and 5 of the section which forms the frame.

It can be understood that because of its characteristics, the central bow enables a particularly effective join to the section to be made without superfluous weight, since it is lightened by its central cavity without reducing its strength.

Between the parallel branches 3 designed to form the handle, braces are placed (Figures 9 and 10) 33 designed to keep them apart in cooperation with the central bow 25 and to avoid their twisting.

The braces consist of a rectangular parallelepiped made of synthetic material positioned edgewise and provided with cavities 34 designed to make it lighter.

The sides of said braces bear two parallel ribs 35 designed to penetrate into the two corresponding grooves 11 and 12 as described above of wall 4 of the section.

The transversal cross-section of the ribs of the braces is larger than that of the grooves which are recessed so as to hold them in said grooves.

Provision is made, as shown in Figure 2, to fit two braces:

the first above the top level of the rigid longitudinal shell 36 which forms the gripping handle and inside which the parallel branches 3 of the section are inserted; and the other inside said shell.

A collar 37 as shown in Figures 9 and 10 substantially rectangular in shape and having on the inside wall of each of its short sides a rib 38 fitting into the housing in the outside wall 5 of each of the branches of the section and a rib 39 on its longest side which fits in between the flanges of said branches and is slotted by force on to the joined branches against the braces of the section until the ribs 39 butt under the top brace at the top of the handle; preferably this collar is made of a synthetic material with a suitable grade of mechanical strength.

It has been shown during tests carried out that the cooperation of the brace and the collar after the branches of the frame have been inserted into the handle provides sufficient strength at the place where said branches are joined.

However, in order to make this coupling even stronger, it is possible, after having made a transversal perforation, in the branches of the section level with the brace, to fix them with a rivet.

A synthetic material 40 (see Figure 2), for example a polyurethane or a material filled or not with fibres is injected into the cavity of the profile which it fills, also penetrating into the cavity 26 or channel of the central bow through the openings 28 made in the wall 4 of the section, this material being preferably of low density.

The effect of this material is to suppress vibrations, to have a damping effect and to increase the strength of the section of the

central bow as well as the effectiveness of the latter's join to the section.

The gripping handle fitted on to the branches as described and previously braced 5 consists of a hollow rigid shell 36 with a rectangular opening 41 at its top end and closed at its bottom end.

The rectangular opening 41 corresponds to the dimensions of the branches of the section 10 assembled on braces.

The shell forming the handle is preferably made of a single moulded piece; however, it is conceivable that it be made of two half-shells fitted edge to edge and glued.

15 The transversal cross-section of said shell is preferably octagonal and irregular, two larger faces coming on either side of sides 6 and 7 of the branches 3 of the section.

The shell as described has at its top end an 20 enlarged part 44.

Its inside walls are provided on either side of its transversal median axis with vertical ribs 45 projecting towards said frame which rest against the sides 6 and 7 of the branches 25 of the section and at its base in the enlarged part there are moulded walls 46 or longitudinal stops which hold the ends of said branches. After positioning the handle as described and butting its top end against the 30 collar cooperating with the brace, a low density synthetic material 60 of the same kind as that which is injected into the space of the section and into the channel of the central bow is injected into the rigid shell 35 through an opening in its wall as shown in Figure 11.

The synthetic material fills up the rigid shell and in conjunction with its edges holds said shell on the branches 3 of the section, 40 fixing it permanently without screws or other means of joining, and eliminating vibrations in the handle.

This arrangement of the invention produces a racket which is very pleasant to grip 45 and hold in the hand, with the pressures distributed throughout the section inside said shell.

After the frame has been made as described, the head and the central bow will 50 be pierced transversally and will receive the cylindrical sheaths (grommets 52, see Figure 3) and the stringing which is carried out in the standard manner.

Because of the reduced number of processes, the industrial manufacture of the 55 frame according to the invention is easy and allows high production rates.

After fixing the central bow, the branches 3 receive two braces 33, one of which is substantially at their end and one two-thirds of 60 the way along the frame of the racket.

The braces 33, parallelepiped in shape, have on each of their sides two longitudinal grooves 51 which receive the bosses 22 in 65 such a way that the braces overlap the sec-

tion.

The top brace cooperates with a collar 37 sliding on branches 3 of the frame so as to hold said brace. After reassembly of the frame as described and hot polymerisation 70 of the resins and fibres, the frame will be pierced for subsequent stringing and will receive the desired decoration.

The invention enables excellent quality, very strong racket frames to be obtained 75 with a minimum of industrial operation.

WHAT WE CLAIM IS:—

1. A frame, for a racket for ball games, comprising an elongated hollow member of which a central portion is shaped into a partial 80 loop to form part of the head of the racket and of which two end portions are placed in parallel spaced relationship and incorporated into a handle of the frame, a hollow central bow separately formed from 85 the hollow member and having two ends each of which is secured to the hollow member where a respective end portion merges into the central portion, said central bow and the partial loop together providing 90 a closed loop intended to carry the usual stringing of the racket, the elongated hollow member being apertures in its wall at each location where the central bow is secured to 95 it such that the interior space of the hollow member is in communication with the interior space of the central bow, said apertures having a length in the longitudinal direction of the elongated hollow member not less than the distance between the inside 100 surfaces of the inner and outer walls of the elongated hollow member, the interior space of the hollow member and the interior space of the central bow having therein a continuous filling of a reinforcing material. 105

2. A frame as claimed in claim 1, wherein said reinforcing material is a low density synthetic plastics material.

3. A frame for a racket for ball games comprising an elongated hollow member of 110 box-section having inner and outer walls integral with side walls of which member a central portion is shaped into a partial loop to form part of the head of the racket and of which two end portions are placed in parallel 115 spaced relationship; a handle receiving said parallel end portions; a hollow central bow located at a throat region where a respective end portion merges into the central portion, bevelled ends of said bow contacting said inner walls over their entire end 120 surfaces, said central bow and the partial loop together providing a closed loop intended to carry the usual stringing of the racket, said elongated hollow member having 125 an aperture in its inner wall at each location where the ends of said central bow engage the frame at opposed walls thereof such that the interior space of the hollow member is in communication with the 130

interior space of the central bow, said apertures having a length in the longitudinal direction of the elongated hollow member not less than the distance between the inside surfaces of the inner and outer walls of the elongated hollow member; brace members formed integrally with said bow at each end thereof extending away from said bow and in parallel disposition to said inner walls and in engagement therewith; means passing through said brace members and said hollow member to effect securing of the bow to said hollow member, and a continuous filling of a reinforcing material being substantially a low density synthetic plastics material filling the interior space of the hollow member and the interior space of the central bow and said apertures.

4. A frame as claimed in claim 3, wherein the surface of each side wall has a longitudinal recessed groove.

5. A frame as claimed in claim 4, wherein the thickness of the material of the hollow member is increased at the junction of the side walls and the inner wall, said inner wall at the junction being of greater thickness than the inner wall, said inside wall of the hollow member having two recessed longitudinal grooves formed at the thickened region, and continuous and preformed elements are located with force fit within said grooves to increase the rigidity and the inertia torque of the head and to

regulate its weight by pre-stressing the hollow member. 35

6. A frame as claimed in claim 3, wherein the gripping handle is a longitudinal shell open at one of its ends, the parallel end portions of the hollow member of the frame being inserted into said shell, at least one brace located between the end portions, an external collar surrounding said end portions to urge the latter against the brace, and a low density synthetic material moulded into said shell joining the latter to the end portions. 40 45

7. A frame as claimed in claim 6, wherein the brace is provided with projecting longitudinal ribs which enter corresponding grooves on the edge of the inside wall of the hollow member. 50

8. A frame as claimed in claim 3, wherein flanges extend inwardly from the edges from the surface of the inner wall of the hollow member. 55

9. A frame for a racket for ball games substantially as described with reference to the accompanying drawings.

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COMPLETE SPECIFICATION

4 SHEETS

This drawing is a reproduction of
the Original on a reduced scale
Sheet 1

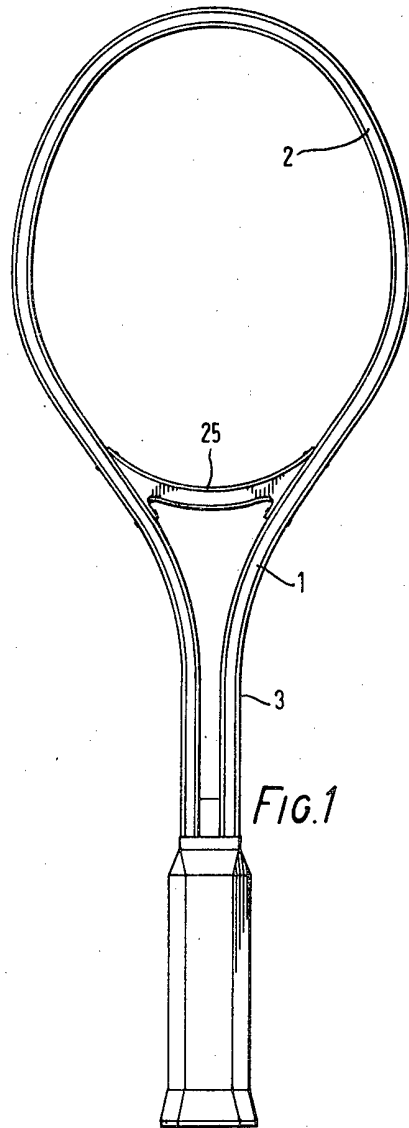


FIG. 1

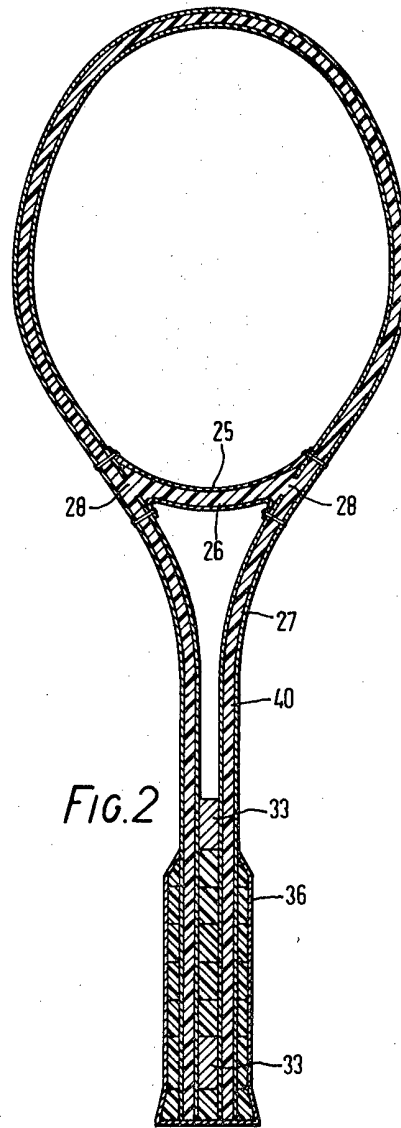


FIG. 2

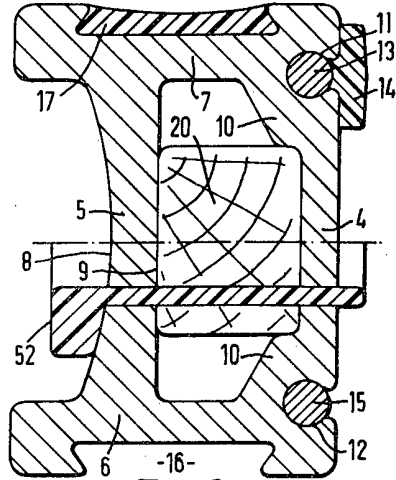


FIG. 3

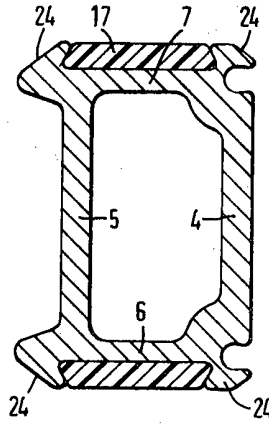


FIG. 5

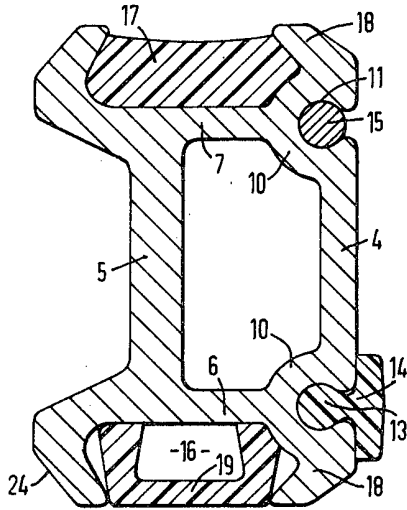


FIG. 4

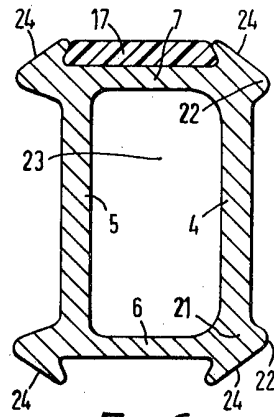


FIG. 6

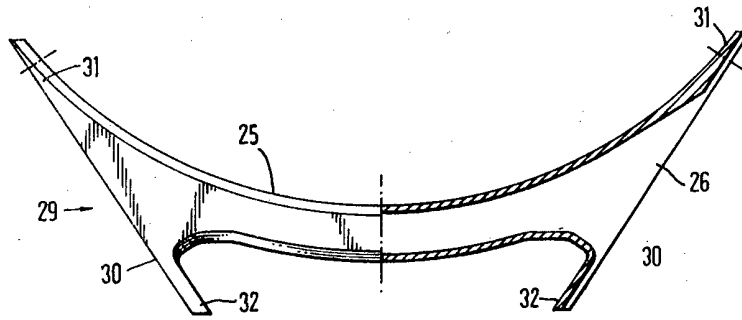


FIG. 7

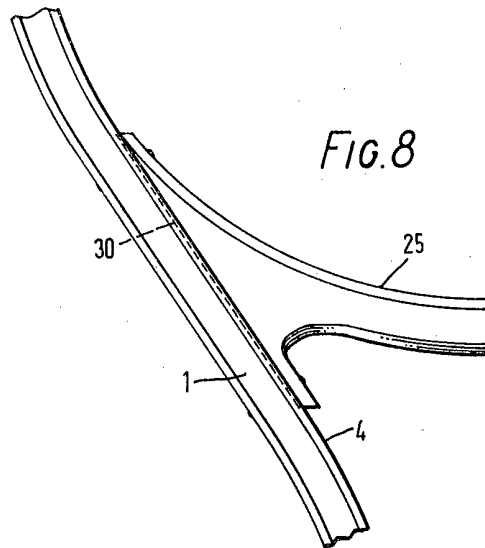


FIG. 8

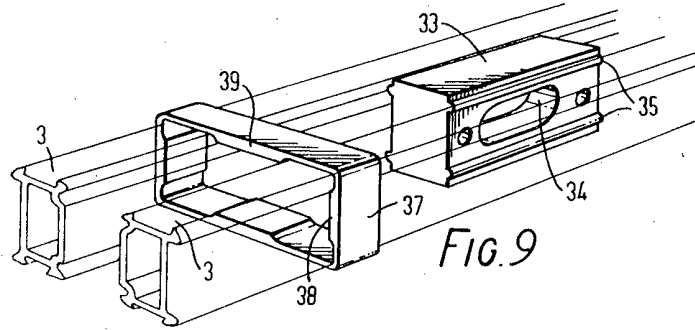


FIG. 9

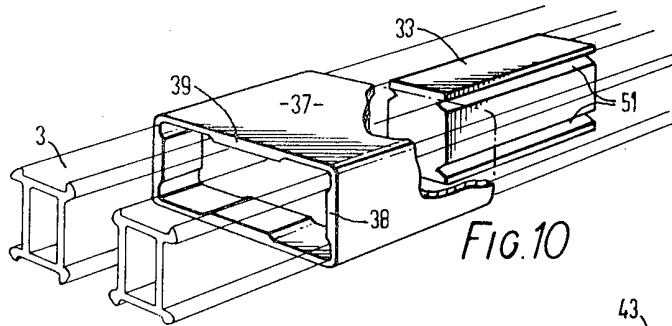


FIG. 10

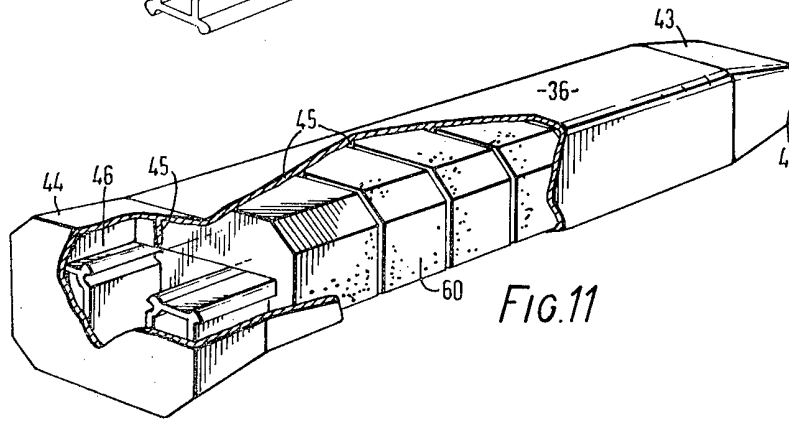


FIG. 11