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(54) Battery terminal plate for motor vehicle

(57) Terminal plate for conical battery pole for motor vehicle comprising a conductor body (2), stamped from metal plate and forming a pair of split rings (3, 4) for clamping on the battery pole, which are interconnected by a pair of clamping seatings (25, 26) and by a coupling connection of end-pieces (9, 10, 11), which is opposite the pair of seatings in relation to the rings, one of the rings extending laterally in a vertical bracket (13) which ends in a support shelf (14) provided with means of fastening (15, 16, 17, 37) electric terminals, the terminal plate also comprising a base (1) which is made of insulating material, for partially accommodating the conductor body, and is provided with a vertical wall (33) and with a bearing shelf (34) which interact with the bracket and the support shelf to ensure their clear relative positioning and strengthening of the conductor body and also the clear positioning of the terminal plate on a battery pole, without the possibility of rotation of the terminal plate on the pole.

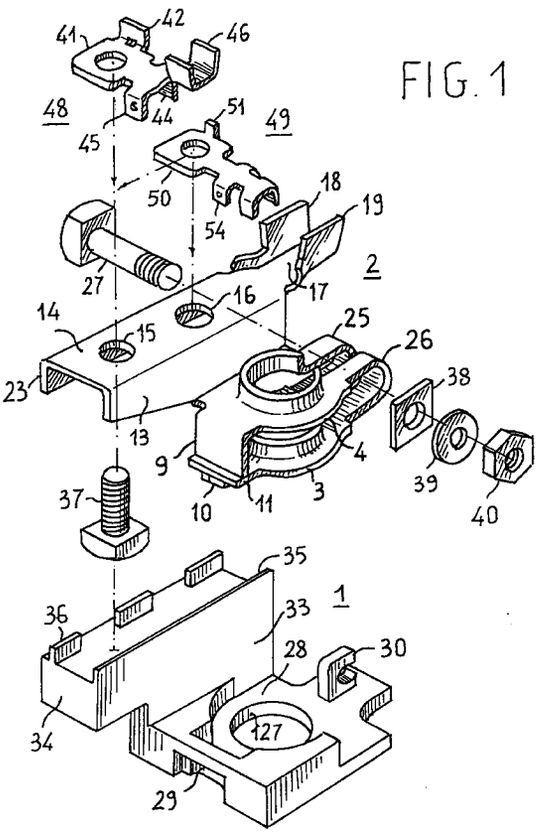

FIG. 1

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Description

The present invention relates to an improved battery terminal plate of the type obtained in a single piece by punching and bending metal plate for mounting on a conical battery pole for a motor vehicle.

Conventional terminal plates for connection to battery poles consist of cast blocks of lead alloy, brass or other material, which are generally U-shaped with a clamping bolt which passes through in the yoke-type arms of the block for their clamping on the battery pole and are very heavy and costly.

Recently, the market has also seen the introduction of stamped terminal plates, made from appropriately bent metal plate, which are intrinsically lighter and more economical but which are not completely satisfactory because they have to satisfy and reconcile with one another a plurality of requirements, such as:

- adequate mechanical robustness;
- stable clamping of the battery pole, even in the presence of vibrations and stresses, a typical situation of a vehicle in movement;
- high conductivity of the terminal plate;
- stable fastening on the terminal plate of the cable ends;
- ease of production;
- easy installation and dismantling.

One particular problem which has not been effectively solved is the tendency to angular rotation of the terminal plate on the pole as a result of vibrations, when installed, and also in the course of clamping.

The rotation, with the terminal plate clamped on the pole, tends to cause the unscrewing of the terminal plate from the pole, impairing the quality of the electric contact.

In the course of installation, the rotation of the terminal plate jeopardizes the correct positioning of the electric cable or of the electric cables for connection which are then inappropriately stressed to fatigue as a result of vibrations, in particular at their end which is rigidly fixed to the terminal plate.

The clamping of cable ends on the terminal plate in turn tends to cause rotation and loosening, if not even detrimental deformation, thereof.

The present invention effectively solves these problems and provides a battery terminal plate made of stamped metal sheet, which has great mechanical robustness, ensures reliable and easy clamping, excellent conductivity and reproducible positioning of the terminal plate and of the electric connection cables, eliminating any possibility of angular rotation of the terminal plate in the course of installation or subsequently, as a result of vibrations.

A further problem found in terminal plates made by stamping, known in the art, is the risk of yielding of the material as a result of excessive clamping.

According to a further aspect of the present invention, this problem also is solved by providing, in a simple and economical manner, means of limiting the clamping deformation which is kept within the limits of elasticity of the material.

These results are achieved with a terminal plate which has the characteristics indicated in the attached claims.

The characteristics and advantages of the invention will be made clearer by the description which follows of a preferred embodiment of a battery terminal plate, which is given by way of non-limiting example with reference to the attached drawings, in which:

- Figure 1 is an exploded perspective view of a battery terminal plate made in accordance with the present invention;
- Figure 2 is a plan view of a sheet stamped to form the terminal plate in Figure 1;
- Figure 3 is a plan view of a sheet stamped to form a first type of cable terminal with a ring for the terminal plate in Figure 1, and
- Figure 4 is a plan view of a sheet stamped to form a second type of cable terminal with a ring for the terminal plate in Figure 1.

With reference to Figure 1, a preferred embodiment of a terminal plate according to the present invention comprises a base 1 made of insulating plastic material and a conductor body 2 made by punching, stamping and bending from a plate made of brass or other copper alloy with high conductivity and good mechanical resistance combined with easy workability.

The plate is expediently of a thickness of between 0.8 mm and 1.5 mm.

Figure 2 shows in plan view the development of the conductor body 2 which comprises a first split ring or lower ring 3, a second split ring or upper ring 4, with juxtaposed ends 5, 6 and 7, 8 of the two rings respectively, which ends are interconnected in two continuous parallel strips which are separated by an air gap of suitable width.

Opposite the open ends 5, 6, the upper ring 4 extends in a squared coupling tongue 9 provided with a coupling tooth 10.

Opposite the open ends 7, 8, the lower ring 3 extends in a squared coupling end-piece 11 provided with an engagement opening 12 for the tooth 10.

The upper ring 4 extends on one side, in relation to the free ends 5, 6 and to the tongue 9, in a support wing or bracket 13 which is continued in a portion 14 which, by virtue of the function performed, can be defined as a support shelf.

Openings 15, 16 are formed in the shelf 14 for the passage of clamping bolts for electric cable ends.

Expediently, the shelf 14 also extends in a clamping clip or cable terminal 17 provided with tabs 18, 19 for permanent fixing, by cramping, of the end of an electric cable with a section of the order of 10-20 mm^2.

Alternatively, it is possible to provide an opening for

fixing a further cable-end clamping bolt.

The internal edge of the ring 3 is expediently stamped so as to form a conical internal contact surface which extends downwards with reference to the view in Fig. 2.

The internal edge of the ring 4 is also expediently stamped so as to form a conical internal contact surface which extends upwards with reference to the view in Fig. 2.

By means of successive bending operations, the conductor body 2 is shaped so as to assume the form shown in Fig. 1.

The bracket 13 is bent upwards at right angles, in relation to the rings, along the bending line 20 which is represented by dashes, and the shelf 14 is bent at right angles, in relation to the bracket 13, along the bending line 21, also represented by dashes, so as to be arranged parallel to the plane of the rings 3, 4.

Preferably, but not necessarily, the free end 23 of the shelf 14 is bent downwards, along the bending line 22, to form a stiffening tab extending in a plane parallel to that of the bracket 13.

The tabs 18 and 19 of the cable terminal 17 are on the other hand bent upwards and arranged for the subsequent cramping of an electric cable end.

The coupling tongue 9 is bent downwards, perpendicularly to the plane of the rings 3, 4.

The free ends of the rings are then bent, with a radius of curvature of the order of 3-4 mm, in such a manner that the ring 3 is arranged below the ring 4, parallel thereto and in axial alignment.

In this manner, the juxtaposed ends of the rings form a pair of seatings 25, 26 (Fig. 1) for accommodating a bolt 27 for clamping the terminal plate.

With the formation of the seatings 25, 26, the tooth 10 is inserted into the opening 12 of the end-piece 11 and is bent so as to be coupled to the end-piece 11.

The structure of the base 1 will now be considered with reference to Fig. 1.

The base 1, generally in the form of a flat, rectangular plate, is provided with a cylindrical opening 127 for passage of a battery pole, and with a seat 28 for the lower ring 3, for the end-piece 11 and for at least a portion of the coupling tongue 9.

Also formed in the base 1 is a mortise 29, which communicates with the seat 28, for the insertion and engagement of the end-piece 11 and of the coupling tooth 10.

The base 1 extends upwards in a thickness 30 provided with a passage throat or opening for the bolt 27 which is interposed between the seatings 25 and 26 and serves as a limiter of the clamping of the rings 3 and 4.

Expediently, to avoid excessive clamping and permanent deformation or breakage of the element 30 which is made of plastic, the metal seatings 25, 26 are provided, as shown in Fig. 2, with a pair of juxtaposed teeth 31, 32 which are separated by a predetermined calibrated air gap which limits excessive clamping of the rings 3 and 4 of the terminal plate, imposing a clamping limit which averts possible yielding of the rings.

The base 1 also extends, upwards, on one side in a vertical lateral wall 33 which is juxtaposed with the bracket 13.

The lateral wall 33 is surmounted by a bearing shelf 34 provided with vertical tabs or teeth 35, 36 which engage in the seating formed between bracket 13, shelf 14 and tab 23 of the conductor body, ensuring the correct relative positioning and the bearing of the tab 23 on the upper face of the bearing shelf.

There is thus formed between the bearing shelf 34 and the support shelf 14 a cavity for accommodating the (preferably square) head of bolts such as 37, which pass through in the openings 15, 16, which bolts are rotationally restrained and rendered captive.

It is to be noted that the base 1 and the conductor body 2, once connected, are also mutually restrained by the engagement of the end-piece 11 and the tooth 10 in the mortise 29 and by the engagement of the clamping bolt 27 in the throat of the clamping-limiting element 30 and in the seatings 25, 26.

Expediently, the seatings 25, 26 are connected to the rings 3 and 4 so as to form two lateral shoulders which engage and prevent the rotation respectively of the head of the bolt 27 and of a square bearing washer 38 interposed between the seating 26 on one side and an anti-unscrewing lock washer (cup, toothed, split and the like) 39 and a clamping nut 40 on the other.

The terminal plate thus made achieves the following advantageous effects.

- It ensures predetermined positioning of the terminal plate vertically on the pole, which is determined by the thickness of the base 1 which rests in the battery cover, in the square space for accommodating the pole, with which all modern batteries for vehicles are provided.

The clamping conditions are therefore reproducible and optimum and are not affected by the conicity of the poles.

- The terminal plate can occupy only one of two predefined angular positions in the square space for accommodating the battery pole, with a frontal or lateral position of the clamping screw, in relation to the battery body.
- The rotation of the terminal plate, as a result of vibrations, stresses imposed by the cables, or clamping actions, is also prevented by interference between the support shelf and one side of the pole seat, and this ensures that clamping is maintained and reliable electric contact.
- Reproducible positioning of the electric cable cramped in the cable terminal 17 in relation to the battery is ensured.
- Mechanical rigidity and robustness of the conductor body is ensured by virtue of the connection

between bearing shelf and support shelf, which makes it possible to apply adequate clamping torques to the clamping devices (bolts such as 37 and associated clamping nuts) mounted on the support shelf 14, without the risk of deforming and twisting the conductor body 2.

- The maximum clamping deformation of the rings is determined by the clamping-limiting teeth 31, 32.
- Electric contact of the conductor body with parts of the battery pole other than the polar cone is excluded.
- Excellent electric conductivity is ensured between the lower ring and the bracket 13, not only through the ends of the two interconnected split rings but also through the conductive connection established by the coupling of the tongue 9 and the tooth 10 to the end-piece 11.

Advantageously, according to a further aspect of the present invention, the terminal plate is provided with cable terminals with a ring of special design, which interact with the support shelf in order to occupy a predetermined position in relation to the terminal plate, and subsequently to be capable of being connected and engaged on the same fixing bolt.

Figures 3 and 4 show the development in a plan view of two types of cable terminal which are made by stamping plate made of copper or copper alloy and subsequently tinned.

Figure 1 shows the same cable terminals in a perspective view.

The cable terminal 48 in Fig. 3 comprises an eye 41 of generally square shape which extends on one side in a perforated end-piece 42 and on another side in a cramping arm 43, from which two opposite tabs 44, 45 for angular positioning and cramping tabs 46, 47 branch off.

With reference to the plane of Figure 1, the end-piece 42 and the tabs 46, 47 are bent upwards, perpendicularly to the plane of the figure, and the tabs 44, 45 downwards.

In Figure 1, the same cable terminal is shown in a perspective view.

When the cable terminal 48 is engaged on the bolt 37, the tabs 44, 45 bent downwards engage with the bracket 13, imposing on the cable terminal a predetermined angular position of the arm 43 on the axis of the bolt 37, essentially perpendicular to the plane of the bracket 13.

The end of a cable cramped on the arm 43 is therefore positioned in a clear position in relation to the terminal plate.

Furthermore, a clamping torque applied to a clamping nut (not shown and screwed onto the bolt 37) is not capable of causing, by friction, rotation of the cable terminal on the axis of the bolt and any inappropriate dislocation and stress of the connection cable is thus avoided.

Figure 4 shows a cable terminal 49 similar to the previous one, with an eye 50 provided on one side with a tooth 51 and on another side with an arm 52 with angular positioning tabs 53, 54 and cramping tabs 55, 56.

While the tooth 51 is bent upwards, the tabs 53, 54 and 55, 56 are bent downwards.

The distance between the bent tongues 53, 54 is expediently smaller than the distance between the bent tabs 44, 45 of the cable terminal 48 in such a manner that the cable terminal 48 can be superposed and connected, in a clear relative position, on the cable terminal 49 with the tabs 53, 54 inserted between the tabs 44, 45 and juxtaposed with these, while the tooth 51 bent upwards engages in the opening of the end-piece 42.

For an accurate connection between cable terminals, the tongues 44, 45 and 53, 54 are drawn so as to form a recess in the tongues 44, 45 which snaps elastically into engagement with a projection formed on the tongues 53, 54.

Connection in a clear relative position, with axially aligned eyes, makes it easy to slip the pair of eyes onto one and the same bolt 37 and allows joint clamping of the two cable terminals.

Of course, there is nothing to prevent the two cable terminals being used separately from one another.

The description above relates to only a preferred embodiment and it is clear that it can be subjected to many variations.

For example, the pair of clamping-limiting teeth 31, 32 can be replaced by a single tooth extending from one of the seatings towards the other.

The fastening of the cable ends on the terminal plate can also take place by other means than cramping or cable terminals with an eye, clamped on bolts, and also by means of tongues for engagement in cable terminals with pin connections (FAST-ON connections) or other kinds, which are compatible with the current-carrying capacities required and allowed by these types of connection.

Claims

1. Battery terminal plate for mounting on a frustoconical battery pole, of the type obtained in a single piece by punching and bending a metal plate (2), comprising a lower split ring (3) and an upper split ring (4) for engagement and clamping on a battery pole, which extend in two parallel planes and have a common axis, perpendicular to said parallel planes, the juxtaposed ends (5, 6, 7, 8) of said split rings (3, 4) being connected to form a pair of seatings (25, 26) for accommodating a clamping bolt (27) of said rings which is arranged in said seatings with its axis parallel to said planes, characterized in that it comprises:

   - a coupling tongue (9, 10) which extends from said upper split ring (4) towards said lower split ring (3) and is diametrically opposite said juxta-

posed ends, for mutual coupling with a corresponding end-piece (11) of said lower split ring (3),

- a support bracket (13) which is perpendicular to said parallel planes and to the axis of said clamping bolt (27) and extends from said upper ring (4) upwards, in the opposite direction to the plane of the lower ring,
- a support shelf (14), at the end of said support bracket, which extends parallel to said parallel planes and is provided with means of fastening (15, 16, 17) at least one end of an electric cable, and
- a base (1) made of insulating material, provided with a cylindrical opening (27) for passage of a battery pole and with a seat (28, 29) for said lower ring (3), said end-piece (11) and at least a portion of said coupling tongue (9),

said base extending on one side, upwards, on one side in a lateral wall (33) which is juxtaposed with said support bracket (13) and in a support shelf (34),
said base (1) extending upwards in a clamping-limiting element (30) interposed between said seatings (25, 26).

2. Terminal plate according to Claim 1, in which said pair of seatings (25, 26) is provided with at least one tooth (31, 32) interposed between said pair of seatings and clamping limiter.

3. Terminal plate according to Claim 2, in which each seating of said pair is provided with a clamping-limiting tooth (31, 32) interposed between said pair of seatings and juxtaposed in a facing manner with the tooth of the other seating.

4. Terminal plate according to Claim 1, 2 or 3, in which said support shelf (14) extends in a clamping clip (17, 18, 19) for cramping the end of an electric cable, which is orientated parallel to the plane of said rings and perpendicularly to the axis of said clamping bolt (27).

5. Terminal plate according to Claim 1, 2, 3 or 4, in which said support shelf (14) extends in a tab (23) parallel to said support bracket (13) and in which said fastening means comprise at least one fastening bolt (37) which passes through in an opening (15) of said support shelf (14) with its head interposed and captive between said support shelf (14) and said bearing shelf (34) and rotationally restrained by said bracket and said tab.

6. Terminal plate according to Claim 5, comprising at least a first cable terminal with a ring (48) which is slipped onto said fastening bolt (37) and provided with a pair of tabs (44, 45) which interact with said bracket (13) to ensure a predetermined position of said cable terminal on said support shelf (13) and to prevent the rotation of said cable terminal on said fastening bolt.

7. Terminal plate according to Claim 6, comprising a second cable terminal with a ring (49) and means (42, 51, 44, 45, 53, 54) in said first and second cable terminal with a ring for positioning relatively in juxtaposition said cable terminals with a ring with the respective rings mutually centred.

8. Cable terminal with a ring (48, 49) for fastening on a battery terminal plate according to the preceding claims, characterized in that it also comprises, in addition to means of cramping (46, 47, 55, 56) a cable end, means (44, 45, 53, 54) which interact with said terminal plate in order to impose a predetermined angular position of said cable terminal, in relation to said terminal plate.

9. Cable terminal with a ring according to the preceding claim, comprising means (42, 51, 44, 45, 53, 54) of relative positioning in juxtaposition of a second cable terminal with a ring, with the respective rings mutually centred.

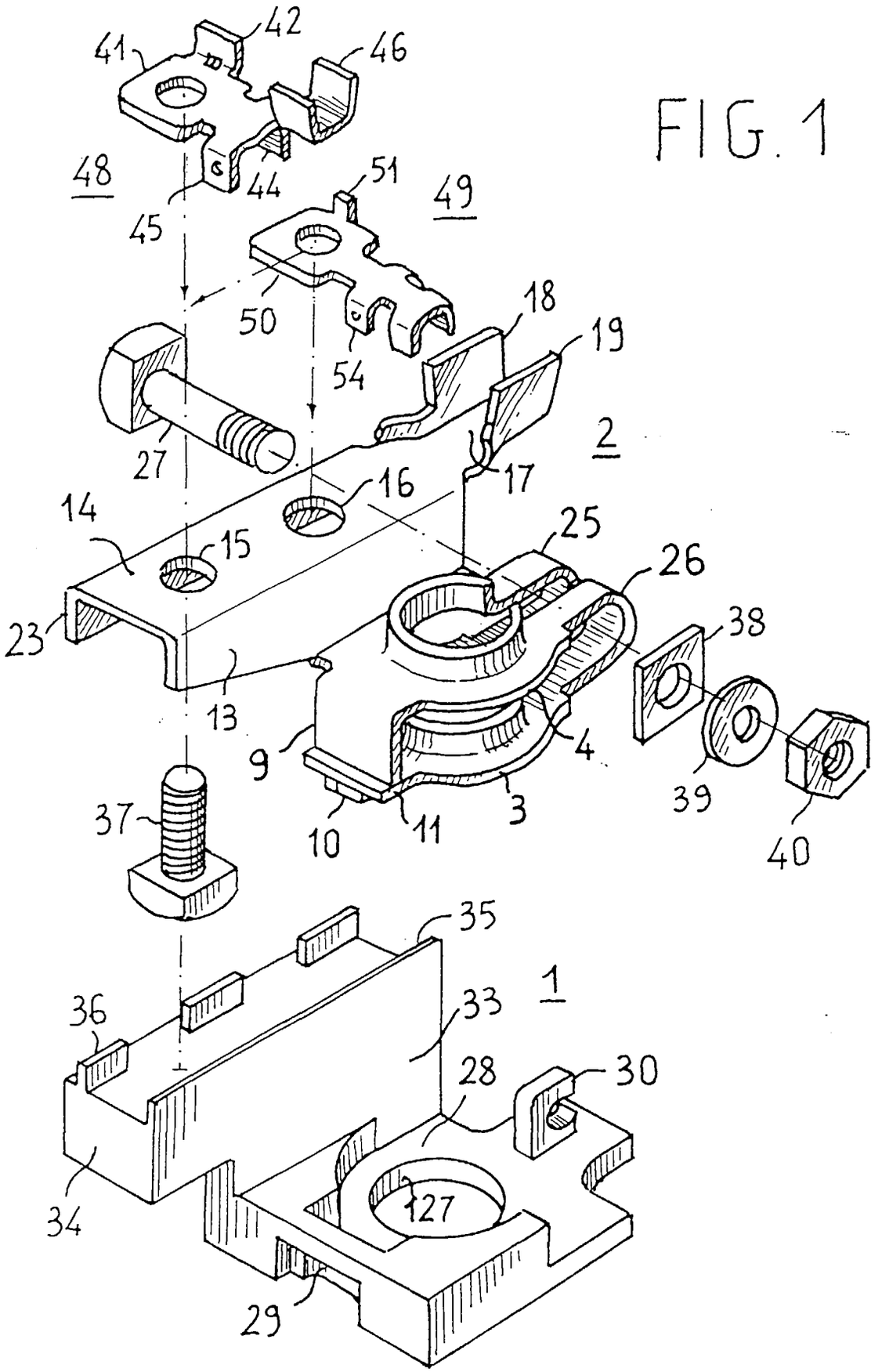
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FIG. 1

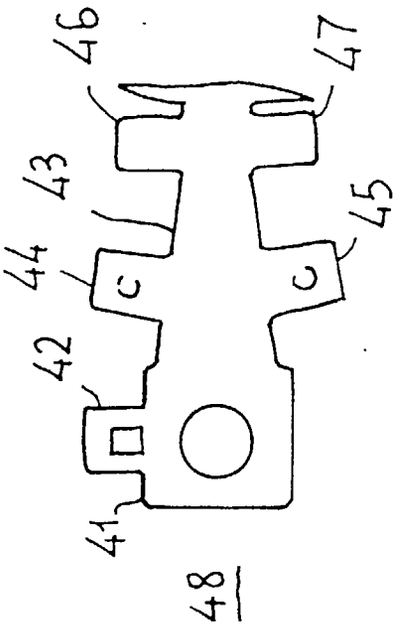

FIG. 3

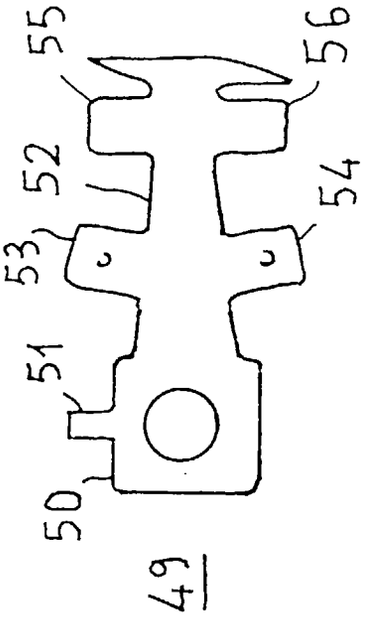

FIG. 4

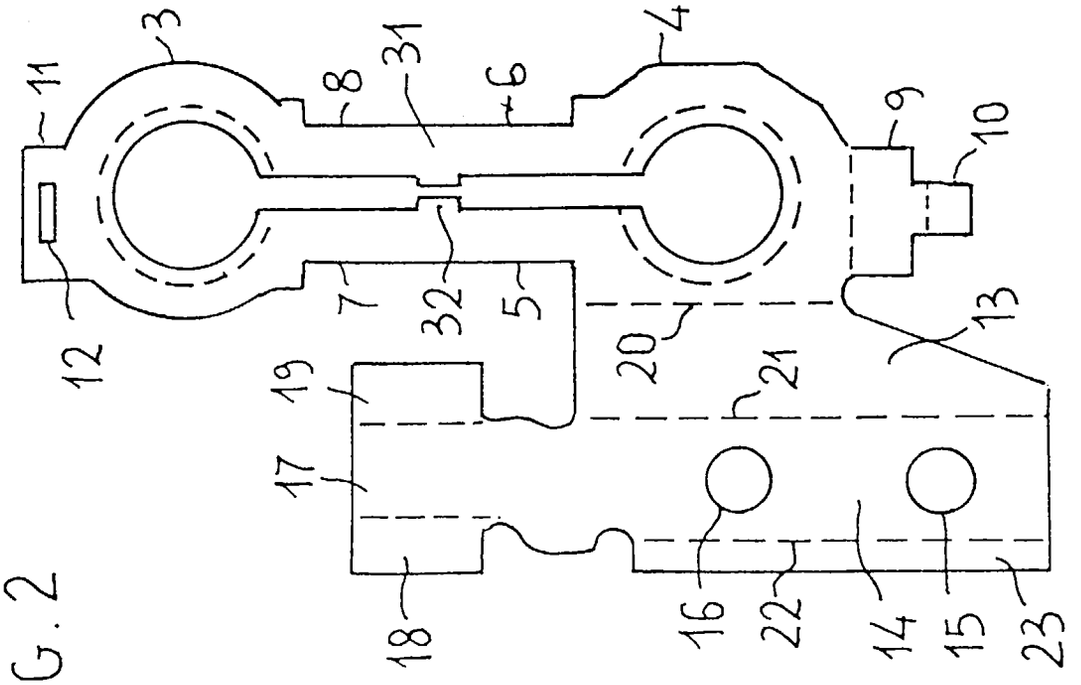

FIG. 2