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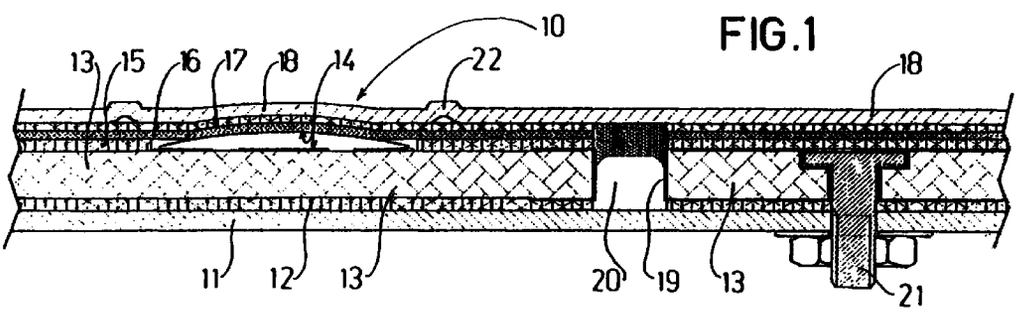
(54) Hermetically sealed keyboard

(57) A hermetically sealed keyboard has a thin outer metallic foil (18) which continuously covers the area of the keys to seal it hermetically; the foil (18) is of a thickness and shape of such as to be elastically flexible at least in correspondence to each of the keys (10) for the activation of the same.

FIG.1



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Description

[0001] The present invention relates to a hermetically sealed keyboard, externally covered with a thin metallic foil; the invention is particularly intended to find applications in rigorous industrial environments, such as for example the petro-chemical sector where gases are present which can transmit electrical charges and where, therefore, flame-proofing is a pre-requisite; the keyboard is also suitable for use in the food and biomedical sectors, where harsh liquids, against which the plastic coverings currently in use have little resistance, are used for washing and disinfecting equipment. Another sector of application is that in which there may be incandescent particles, such as for example in foundries.

[0002] All of the above-mentioned harsh or aggressive agents may gain entry to the interior of the keyboard via the interstices which exist between the keys and the key-plate of the keyboard itself.

[0003] There are some well-known kinds of hermetically sealed keyboards covered with a continuous layer made of plastic material, such as polyester; this alternative, however, does not solve the problem with regard to the majority of the above-mentioned environments, for example in a foundry where random flying sparks are present.

[0004] There are currently well-known keyboards in which the outer part of the keys and the surrounding key-plate are made of stainless steel (see, for example, EP-A-0585536 and GB-A-2046524). While these alternatives have satisfactory characteristics from the point of view of robustness, the exposed outer parts of the keys are arranged flush with the surface of the key-plate but are separate from it, so that in certain environments it is not possible to guarantee a totally hermetic seal which is sufficient for protection against all the hazardous agents mentioned above.

[0005] An aim of the present invention is to realise a hermetically sealed keyboard of a perfected type capable of satisfying the requirements discussed above.

[0006] These and other aims and advantages, which will be better understood hereinafter, are achieved according to the present invention by means of a hermetically sealed keyboard characterised by the fact that it comprises a thin outer metallic foil which continuously covers the entire area of the keys to seal it hermetically, said foil having a thickness and shape of such as to be elastically flexible at least in correspondence to each of the keys for the activation of the same.

[0007] There will now be described the structural and functional characteristics of a preferred but not limiting embodiment of the keyboard according to the present invention, reference being made to the accompanying drawings, in which:

FIG. 1 is a partial sectional view of a keyboard according to the present invention; and

FIG. 2 is an external view of part of the keyboard.

[0008] With reference to FIG. 1, in correspondence to a key, the position of which is indicated with 10, a well-known type of keyboard comprises, starting from the bottom, a lower metallic support foil 11, an intermediate layer of insulating material 12, an electronic circuit board, for example in the form of a printed circuit, 13, a snap disc contact element 14 of a well-known type, which is surrounded by a spacer which is adhesive on both sides 15 and is covered by an upper layer of insulating material 16. According to the invention, the outer surface of the keyboard is comprised of a single thin metallic foil 18 preferably made of, but not limited to, stainless steel of a suitable thickness, which continuously covers all the above-mentioned elements of the keyboard in order to protect the area of the keys and render it waterproof. Between the foil 18 and the upper insulating layer 16 there is a spacer layer which is adhesive on both sides 17.

[0009] There are a number of connection holes 19 in the printed circuit board (only one hole is shown in the drawing), in each of which is inserted an element 20 made of conductive material for the connection between the upper or outer foil 18 and the lower or inner metallic foil 11. Further metallic elements 21 for contact to earth are also provided for.

[0010] The embodiment in sectional view of the keyboard as illustrated hereabove is given as an example only, the keyboard may be modified in any way in terms of its shape and the arrangement of its parts in accordance with necessity and the specific uses to which the keyboard is to be put.

[0011] The object of this invention is, in fact, constituted by the thin metallic foil (18) which continuously covers the keyboard at least in the area of the keys.

[0012] It has been found from tests which have been carried out that it is preferable to use stainless steel for reasons of cost, flexibility and resistance to chemical products used in cleaning and so on. It should, however, also be understood that other metallic materials perform well as regards the above-mentioned characteristics of cost, flexibility and resistance to acids.

[0013] As far as the thickness of the outer metallic foil 18 is concerned, it should be such as to ensure that the foil is flexible at least in correspondence to the keys, so that it can elastically yield when subjected to normal finger pressure on the part of the user; the outer foil should preferably have an approximate thickness of between 50 and about 100 μm.

[0014] The thickness could be uniform throughout all the areas of the foil, as shown in the example illustrated in FIG. 1; alternatively, according to a variation of the invention (not illustrated) it could be possible to differentiate between areas of a first level of thickness (for example, less thick) in correspondence to the keys, and a second level of thickness, greater than the first, in the areas surrounding the keys and in the other areas.

According to a further alternative embodiment (not illustrated) the thickness in correspondence to each key could be greater than the thickness in the immediately surrounding area; in such a case, it would obviously be the surrounding area that would flex to allow the key area to depress and cause contact with the snap disc contact element 14.

[0015] A greater or lesser degree of flexibility may be obtained either by realising greater or lesser degrees of thickness in correspondence to the keys or the area surrounding them, or by suitably moulding the outer foil 18, for example by forming folds in it around or above each key so that the part of the foil which is pressed depresses elastically to activate the selected key.

[0016] In any case the geometry of the outer foil should be such as to allow the area of the key in correspondence to the snap disc contact element 14 to depress when pressed and activate the contact, and then elastically return to its original resting position once the key is released.

[0017] In the preferred embodiment illustrated in FIG. 1, the outer foil 18 is slightly convex towards the outer part of the key area 10, following the profile dictated by the shape of the snap disc contact element 14 in a resting position. It should, however, be understood that it is equally possible to produce keyboards of a different form, for example smooth, which can still be such as to allow the activation of the selected key.

[0018] Still with reference to FIG. 1, in the particular form of preferred embodiment illustrated, the area of the outer foil which determines the periphery of each key forms a relief 22 which serves as a stiffening to limit flexion in the convex area, when the key is depressed, in the area corresponding to the key only.

[0019] With reference to FIG. 2, as far as the realisation of the symbols 23 which identify the keys 10 is concerned, the outer foil 18 of the keyboard according to the invention could be subjected to the following alternative treatments:

a) localised passivation in the area of the keys or galvanic coating in metal or alloy, with the consequent achievement, in both cases, of areas of a different colour in relation to the rest of the outer foil;

b) the application of coloured ceramic paste which is suitably baked at a high temperature;

c) the localised application of epoxy type materials.

[0020] Symbols realised according to the above-mentioned methods do not run the risk of being damaged by solvents and other chemical cleaning products, for this reason they can even be normally washed and disinfected using harsh products, without any damage or alteration to the symbols nor any risk of the aforementioned harsh substances penetrating to the interior of the keyboard which is, as has already been discussed, rendered completely waterproof by the outer foil 18 which protects it from the outside without any discontinuity.

[0021] As can be appreciated, the keyboard according to the present invention offers protection to users, in that it exerts a shielding action in terms of radio frequency emissions (EMI); the keyboard also allows the avoidance of an accumulation of electrostatic charges on it, a phenomenon which occurs, on the other hand, with keyboards currently in use which are covered with a layer of plastic material, and for this reason the keyboard according to the present invention has many advantages for applications in environments where, for reasons of flameproofing, electrostatic charges are absolutely to be avoided.

[0022] It is to be understood that the present invention is not limited to the embodiment described and illustrated above, which is to be considered purely as an example of the use of the keyboard, which may be modified in terms of shape, dimensions and constructive and functional details. The invention is intended to include all modifications which fall within its scope, as defined by the following claims.

Claims

1. A hermetically sealed keyboard characterised by the fact that it comprises a thin outer metallic foil (18) which continuously covers the entire area of the keys to seal it hermetically, said foil (18) having a thickness and shape of such as to be elastically flexible at least in correspondence to each of the keys (10) for the activation of the same.

2. A keyboard according to Claim 1, characterised by the fact that said outer foil (18) is made of stainless steel.

3. A keyboard according to Claim 1, characterised by the fact that said outer foil (18) is of a uniform thickness in all of its areas.

4. A keyboard according to Claim 1, characterised by the fact that said outer foil contains areas which are more flexible in correspondence to the keys (10).

5. A keyboard according to Claim 4, characterised by the fact that said more flexible areas are of a lesser thickness in relation to the remaining parts of the keyboard.

6. A keyboard according to Claim 4, characterised by the fact that said more flexible areas are situated above the keys.

7. A keyboard according to Claim 4, characterised by the fact that said more flexible areas are situated in the area surrounding each key.

8. A keyboard according to Claim 1, characterised by the fact that said outer foil (18) is slightly convex towards the exterior in correspondence to the keys.

9. A keyboard according to Claim 1, characterised by the fact that said outer foil (18) forms a peripheral stiffening relief (22) around the areas corresponding to each key (10).

10. A keyboard according to Claim 1, characterised by the fact that the outer surface of said foil (18) may be subjected to any of the following treatments in order to realise symbols which distinguish the keys (10):

a) localised passivation in the area of the keys or galvanic coating in metal or alloy, with the consequent achievement, in both cases, of areas of a different colour in relation to the rest of the outer foil;

b) the application of coloured ceramic paste which is suitably baked at a high temperature;

c) the localised application of epoxy type materials.

FIG.1

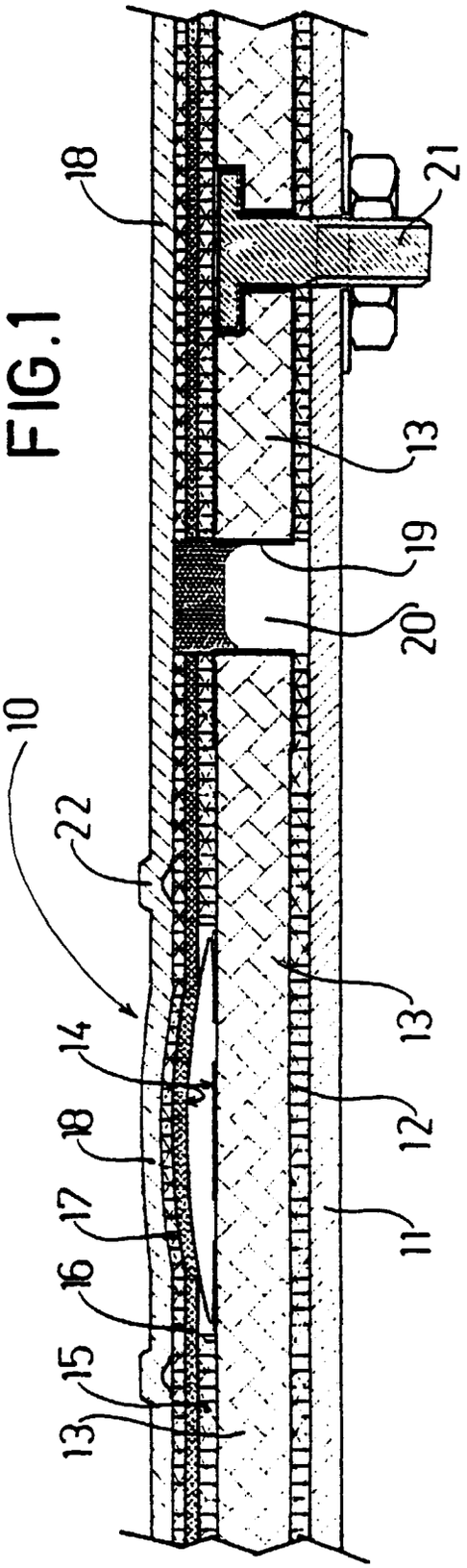
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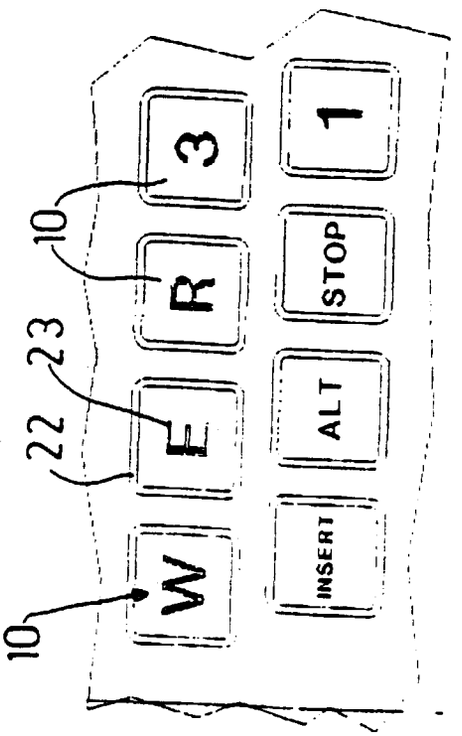
FIG.2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