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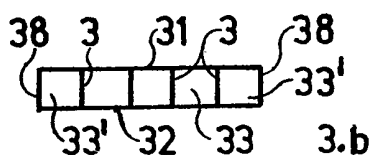
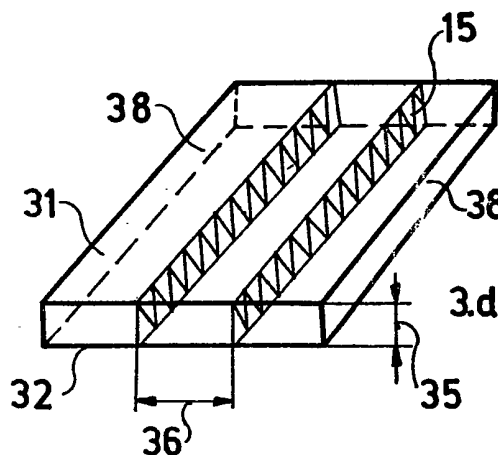
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(54) Storage battery electrode of
improved specific output and a
process and apparatus for the
production of the box plate or
casing for such electrode

(57) A boxed plate lead battery
electrode characterized in that it is
closed on two sides by a respective
planar wall 31, 32 continuously

bounding all separator compartments
between the side walls 38 connecting
the two planar walls. The side walls 3 of
the compartments are arranged in
parallel with the side walls 38 so that
they form diaphragms made from strips
or threads.

The process according to the
invention may use fabric or web
material. In the case of a fabric-based
product the thread walls forming the
diaphragms are woven 'in space' into
the two continuous walls 31, 32 while
the latter are maintained at a height
difference corresponding to the
thickness of the plate, while in the case
of a web or tissue-based product, the
two continuous walls are laid one upon
another and the side walls 3
corresponding to the compartments are
formed by stitching together the two
continuous walls with loose stitches
employing excess thread of a length
chosen in accordance with the desired
air gaps in the diaphragm.



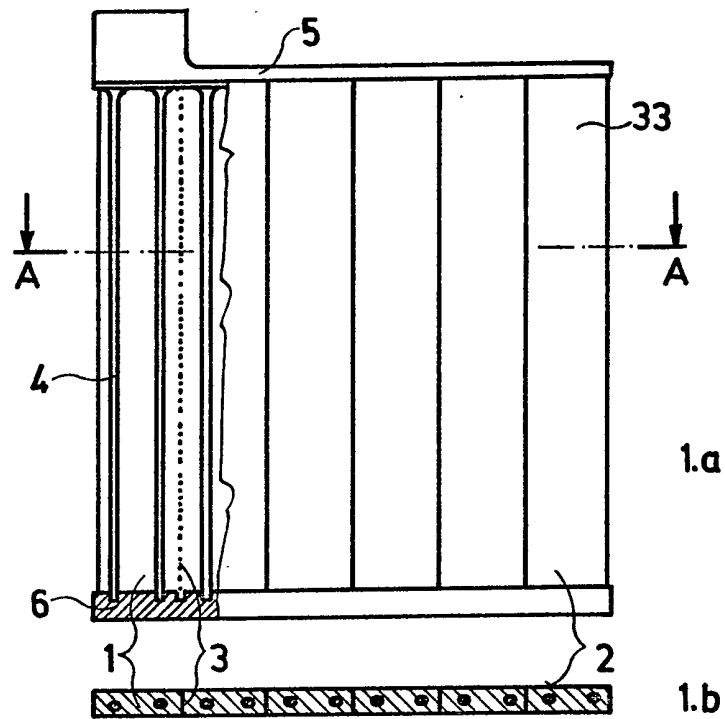


Fig.1

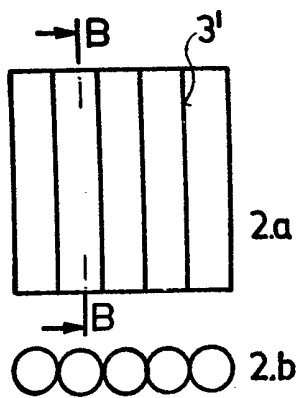
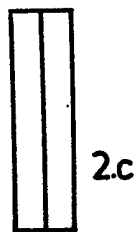
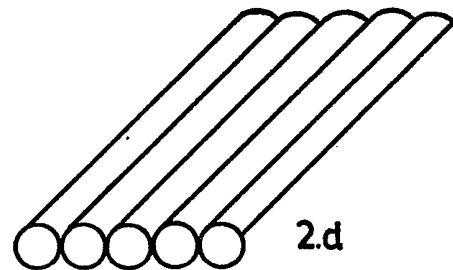


Fig.2

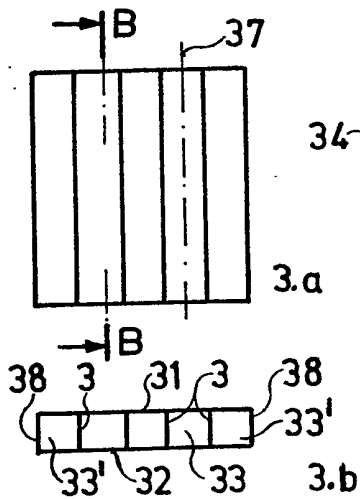
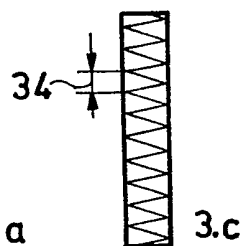
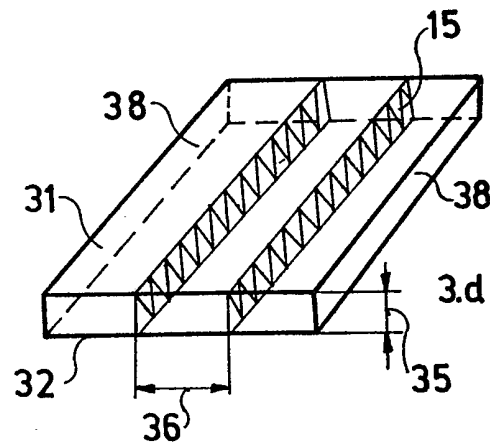


Fig.3

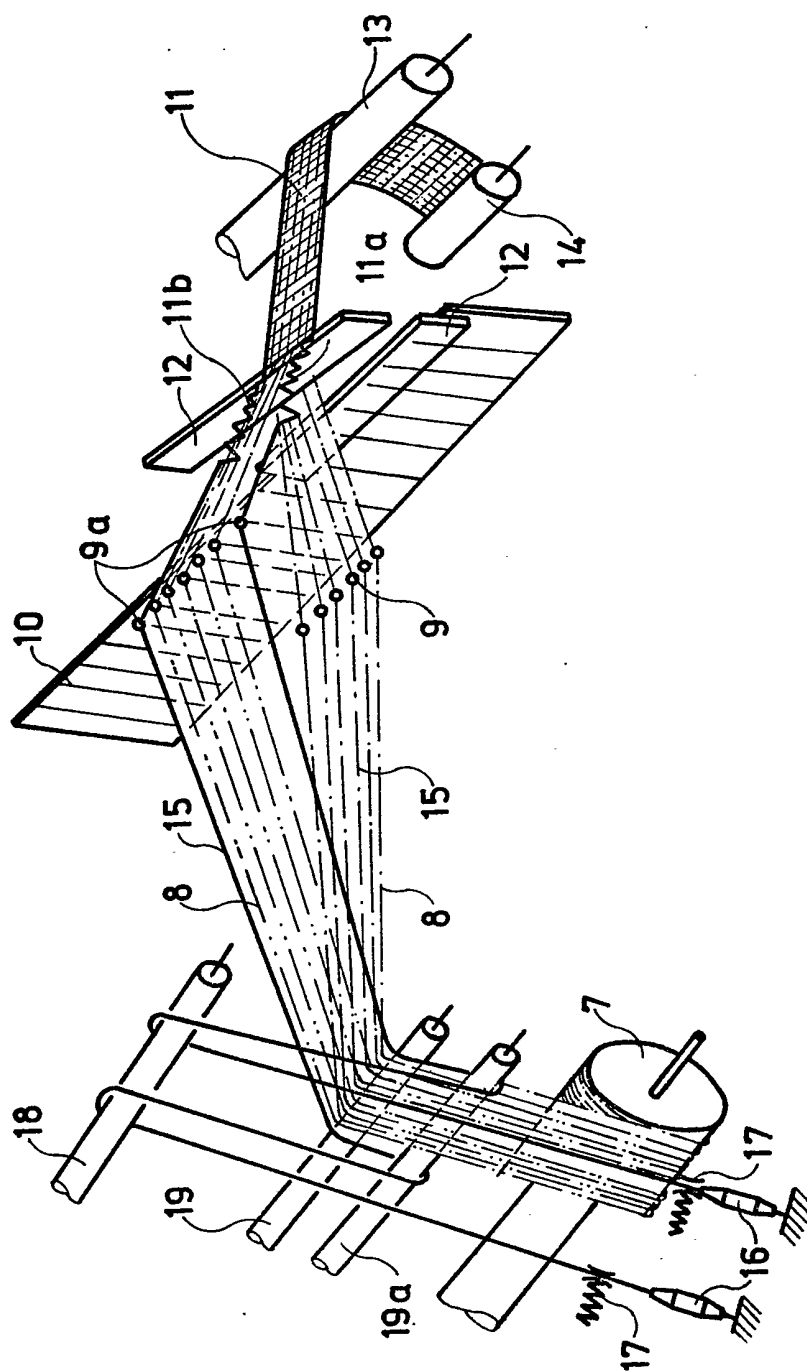


Fig.4

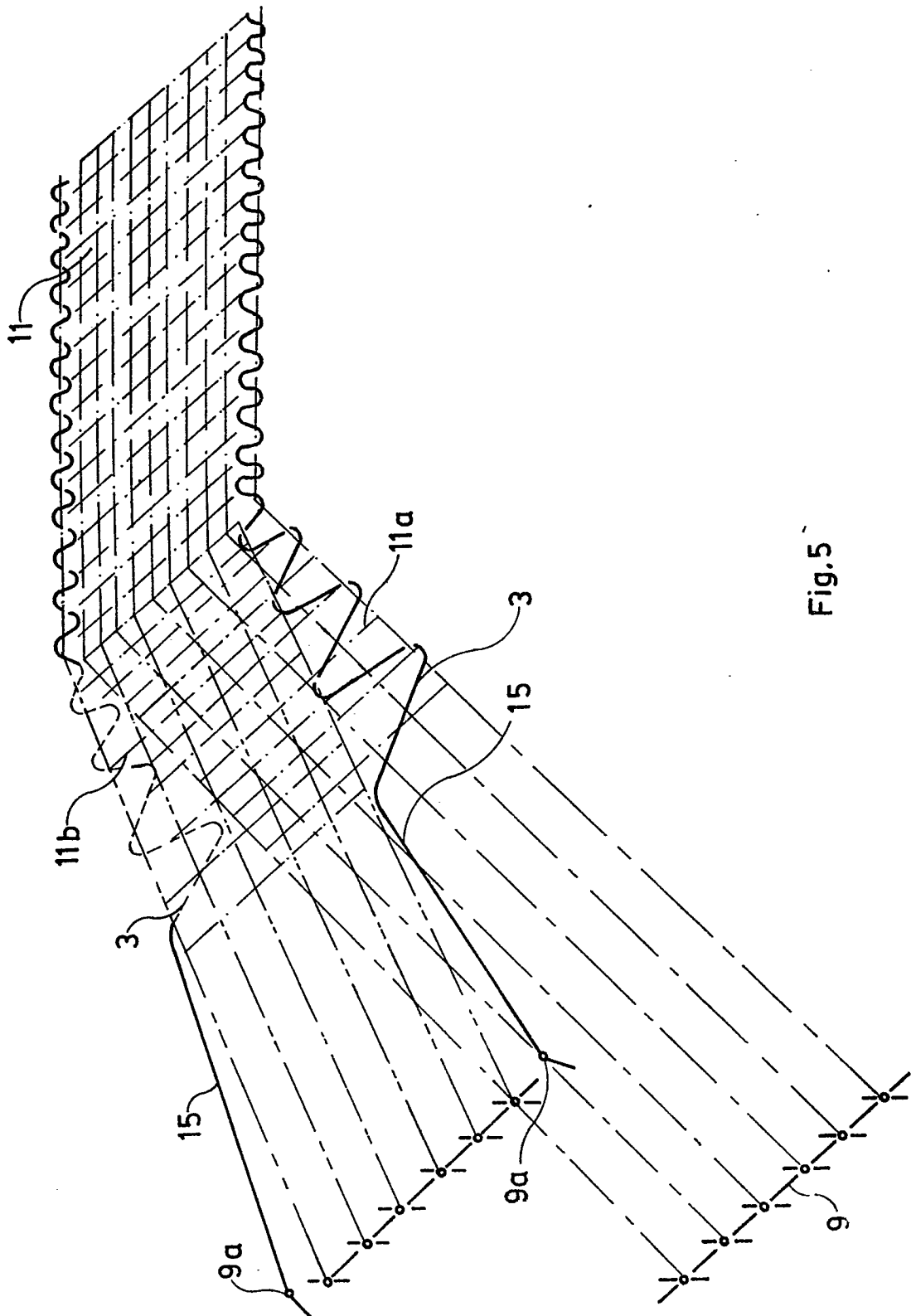


Fig. 5

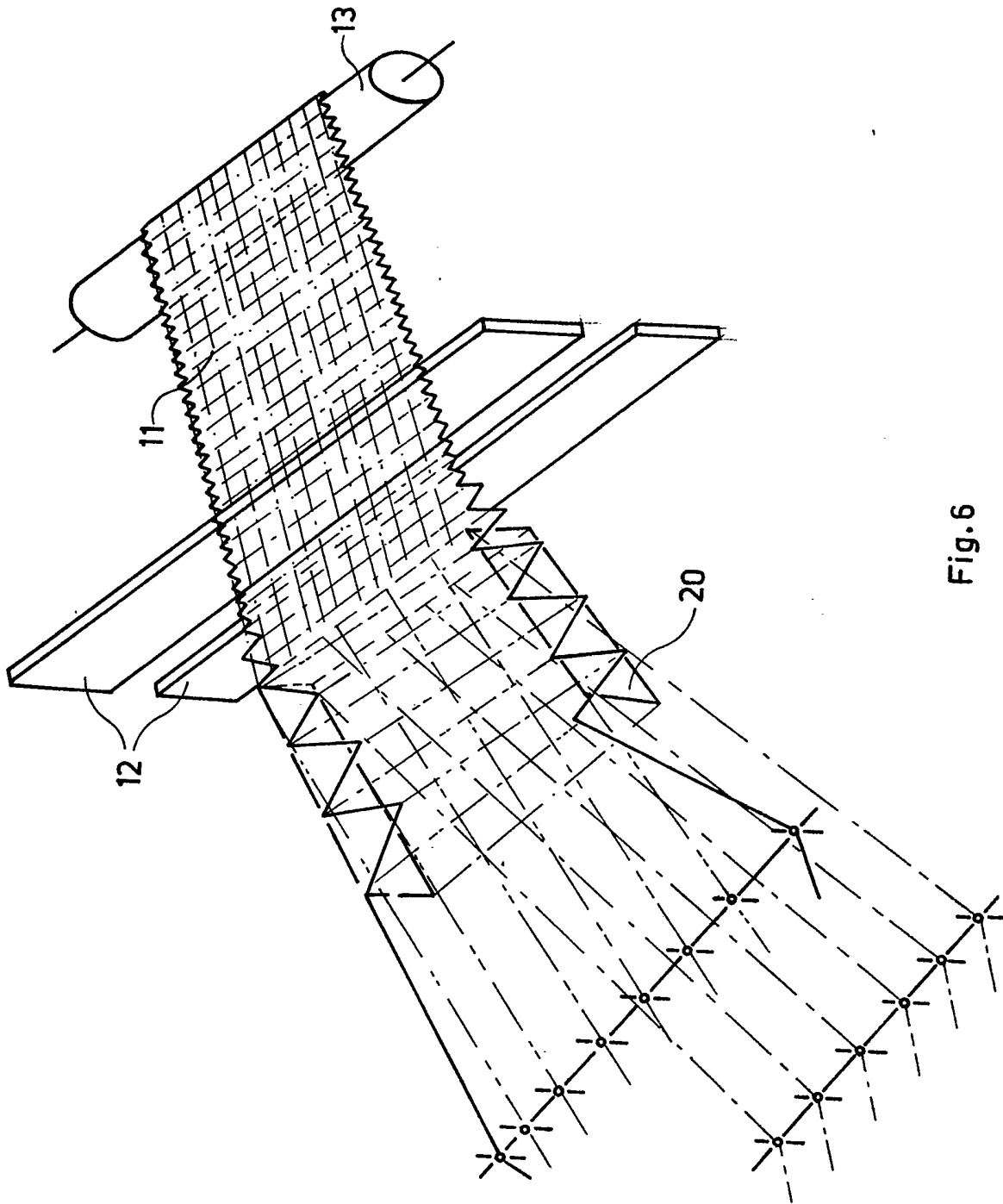


Fig. 6

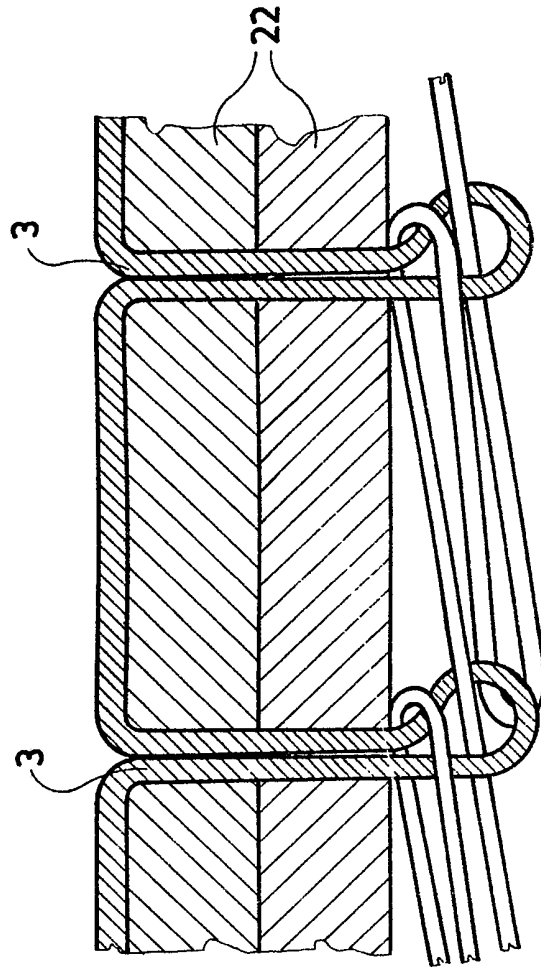


Fig.7

SPECIFICATION

Storage battery electrode of improved specific output, and a process and apparatus for the production of the box plate or casing for such electrode

The invention concerns electrode plates for storage batteries (accumulators), such as lead-acid batteries, of novel construction wherein the specific quantity of the active electrochemical medium (lead) and its distribution within the whole plate volume are more favourable than in known constructions and thus the specific output is also improved. The invention furthermore concerns a process and apparatus for the production of the separator or casing of the novel type of storage battery electrode.

With the exception of starting batteries for motor vehicles, in the various lead storage battery constructions the so-called boxed plate construction is used as the positive electrode. The known boxed plate is a product of textile technology which is filled with active material to obtain a boxed plate battery electrode and consists of a multiplicity of juxtaposed fabric hoses made from a material which is resistant to the chemical effects of the media forming the battery. Current-conducting rods are passed through the individual hoses juxtaposed in parallel and the hoses are at least partly filled with an active electrochemical medium.

The hoses may be made singly and fitted together, but expediently a complete row of hoses is manufactured as a continuous body, the current-conducting rods are thereafter threaded through the individual hoses and then the hoses are filled with the active electrochemical medium. The thus formed boxed plate is then closed at the top and at the bottom by a respective current conducting bridge. The known boxed plate electrodes are in general woven from acid-resistant plastic filaments in the form of so-called double-fabric; that is to say, in the manufacturing apparatus wrap threads are wound from a wrap cylinder arranged at one side and from them an upper fabric branch and a lower fabric branch are woven, while the branches are advanced mutually in parallel, whereafter the branches are finished by thermosetting in such a manner that the upper and lower fabric branches are formed into closed hose-like tubes. In earlier times the hoses were practically of right circular cross-section but more recently box plate constructions have become known wherein the hoses are of rectangular cross-section with rounded corners. The fitting together of the hoses along approximately parallel plane surfaces results in plates which can bear greater loads and which are thinner relative to the specific output and wherein the spatial distribution of the active material is also more favourable. Nevertheless, it is a characteristic even of the improved box type plate construction that one cannot avoid the formation of a continuous double partition wall or separator to which no active material can penetrate. Between the partition walls and the individual hoses (which could be called

compartments) further space portions are formed which are inactive from the point of view of the electrochemical process, thus for instance at the location of the connection between the hoses or compartments (hereafter: compartments) as a result of the curvature of the circular or elliptical cross-section compartments, or, in the case of rectangular cross-section compartments, the gaps arise due to the rounding at the corners of the rectangular cross-section.

The inactive parts of the plate constitute an excessive material consumption and thus the weight and production costs of the plate increase while the specific output per unit of weight or unit of volume is reduced. One cannot use totally planar box plates which would have only a minimal amount of inactive volume along the inevitable partition wall because the volume of the active material repeatedly changes in operation of the battery (the cyclical alternation of charging and discharging) and thus the active material is loosened. The hose construction is advantageous precisely because of this process, since if the positioning of the active medium was not "divided up" by the hoses, then, by virtue of the bulging out of the casing, the active medium would collect at its bottom and the life of the electrodes would be further reduced.

The basis of the invention is the discovery that one can optimally approximate the completely planar interfitting and the resultant of the inactive space elements between the compartments may be optimally reduced when all the compartments are continuously bounded by a first wall and a second wall extending in two planes parallel with the longitudinal axes of the compartments and with each other, each wall forming a continuous body of synthetic fabric or tissue (web); the edge compartments being connected, in parallel with a longitudinal axes of these compartments and perpendicularly to the first and second walls, by a respective side wall externally bounding these compartments in a third plane and a fourth plane, and in the encompassed interior of the casing or box plate the adjacent compartments are provided with a respective membrane or diaphragm in boundary planes parallel to the compartments and perpendicular to the first and second walls in such a manner that along the common boundary plane strips or threads interconnect the first and second walls at a predetermined spacing.

Expediently, the individual diaphragms are constituted by a single thread passing along the common boundary plane by means of a hem stitch (a jour openwork). The diaphragms may also be formed between neighbouring compartments by fitting discrete strips between the first and the second walls.

In the case of such a construction a greater fraction of the internal space of the plate can be filled by active electrochemical media than hitherto and although the diaphragms or membranes greatly limit the free mobility of the medium during electrochemical transformation, nevertheless the medium forms a continuous whole extending over

the complete casing. Both the 'filling factor' and the uniformity of distribution within the internal volume are improved the fraction of inactive spatial elements is reduced and the specific output is correspondingly improved. At the same time, this construction creates more favourable conditions of production technology and provides possibilities for measures improving the manufacturing process and its tooling. It is an additional advantage that this construction not only enables the utilisation of relatively simple and outstandingly productive production technology of plate casings based on textile materials but also plates based on the more recently introduced and popular web or tissue can also be very simply manufactured in the constructional form according to the invention.

In the final result therefore, by virtue of the construction according to the invention the partition walls between the individual compartments of the plate do not form a densely-woven continuous body as is the case for the first and second walls, but rather they form diaphragms constituted by plastics strips or expediently textile threads connecting the first and second walls at an appropriate spacing. By means of such a diaphragm partition (separator) the ratio of inactive spatial elements is significantly lower than in plates made with rows of hoses according to the state of the art and yet the partition wall sufficiently satisfactorily assures the parallel orientation of the plate surfaces and that in practice there should not be any bulging and the prevention of the active material from collecting at the bottom of the casing.

The process according to the invention has two main variants in each of which the actual mode of carrying out may vary over wide limits but which have the common characteristic, that the first and second walls constituting a continuous body, whether made from a fabric or a web, are produced first, so as to form an upper and a lower branch of fabric or web and while the two branches are continuously advanced the lateral or edge compartments are enclosed by a respective continuous side wall along external boundary planes while the strips connecting the first and second walls between the compartments are formed at a suitable spacing along the boundary planes and these strips will form the diaphragms along these boundary planes.

In one variant, the process consists in producing the first and second walls as upper and lower fabric branches by weaving and the strips constituting the side walls and the diaphragms, also made by weaving technology, are simultaneously introduced between the double wall.

In the second variant of the process, firstly there is produced in a manner known per se a web of a geometry identical with that of the fabric wall, that is to say upper and lower web branches, and then the two web branches are sewn together such that the side walls are sewn by close stitching while along the planes bounding the compartments the stitching is at a density which assures the required air gaps.

The common characteristics of the two variants originate from the fact that ultimately the same structure is to be produced and the differing para-

meters of characteristics originate from the differences between the structure of the fabric and of the web and their respective production technologies.

In this specification 'fabric' is the term used for the material which is brought about by fitting together an ordered combination of filaments or fibres while 'web' is the term used for a material wherein the elementary threads or filaments are connected together in an unordered structure but such that in the use destined therefor by the invention the web should have the same or similar characteristics as the fabric; this can be a cross-linked plastics material or a filamentary medium embedded in a filler or carrier or adhesive. A few characteristic types of materials manufactured in web form and their essential characteristics are described in the Hungarian book entitled "Műanyag Zsebkönyv (Műszaki könyvkiadó, Budapest, 1979)" ("Plastics Pocket Reference Book" Technical Publishing House, Budapest 1979) Editor Dr. Lajos Kovács: see for instance page 867. For instance, an advantageous type of material is a pile material produced by web technology.

In the weaving process according to the invention the circumstances is exploited that the upper and lower fabric branches try to move apart or spread out as a result of an internal force effect as the material is advanced along the manufacturing apparatus. If this tendency to spread is limited to a constant value, e.g. by utilising limiting bodies in the plane of the interconnection (where the side walls and the diaphragm elements are woven-in) then the side wall and the diaphragm will have the height appropriate for the thus obtained spacing. This constant value is to be chosen in accordance with the desired thickness of the plate while the spacing between the neighbouring diaphragms (separators) is chosen in accordance with the desired width of the compartments of the plate. Both the height of the wall and the spacing originate from the same consideration, i.e. the appropriate dimensions of the plates or casing according to the state of the art and therefore the criteria for choosing them are not discussed. However, in the manufacture of boxed plates of fabric base the two branches, namely the upper and lower fabric branches, are so connected by means of the side walls and the diaphragms that the two branches laid on top of each other are sewn together (with a dense stitching for the side walls and with a stitching density suitable for assuring the air gaps for the diaphragms), but for each stitch the thread length is longer than the combined thickness of the two branches of the fabric, the excess length corresponding to the prescribed thickness of the plate, whereby on filling the box plate with the active electrochemical medium the latter forces the first and second walls formed by the two branches apart to the desired spacing.

The invention is described in greater detail with the aid of the accompanying purely schematic drawings illustrating preferred embodiment, wherein:—

Figure 1 shows an electrode plate according to the invention, more particularly Figure 1a shows such a plate in a side view in its assembled or use position and Figure 1b is a cross-section taken along the plane A-A shown in Figure 1a;

Figures 2 and 3 respectively show the prior art and the present invention each in four separate positions respectively designated a, b, c and d;

Figure 4 is a perspective view of a preferred embodiment of apparatus for making a fabric box-type plate or casing according to the invention;

Figure 5 is an enlarged detail of Figure 4;

Figure 6 is another enlarged detail of Figure 4 but showing a variant, and

Figure 7 illustrates the stitching process for the boxed plate made from web material.

Figure 2 showing the box plate or separator according to the state of the art and Figure 3 showing the box plate or separator according to the invention enables a comparison to be made via four

mutually corresponding partial views. Figures 2a and 3a show the plate in the same view as Figure 1a but before assembly, while Figure 1a shows it in its assembled position. Figures 2b and 3b are in a cross-sectional view corresponding to Figure 1b.

Figures 2c and 3c show the contour lines that may be seen on taking a longitudinal section of the still empty separators, that is to say a cross-section along the planes B-B shown in Figures 2a and 3a respectively, while Figures 2d and 3d show the separators in perspective, respectively, according to the state of the art and according to the invention. Since the position of the separator of the electrode relative to a reference plane during manufacture deviates from

its position in use or operation, when describing the separator any geometrical references or adjectives are not related to its operational position as would be the case when referring to the assembled electrode plate but rather are related to the position of the longitudinal axis of the compartment; when describing the process and the apparatus the geometrical references or adjectives refer to the relative positions of the two branches of fabric or web during manufacture.

The reference symbols are repeated in the various Figures only to the extent required for understanding, for the sake of clarity. The references to the symbols or numbers always refer to the Figures where they may be found but in given cases also to those Figures where the given reference symbol or number may not be shown but by comparing it with the references to be found on that Figure the element referred to by that symbol may be identified with.

Figure 1 clearly illustrates the common properties of the electrode according to the state of the art and also according to the invention. The compartments 33 of the box plate or separator 2 are closed in two boundary planes perpendicular to their longitudinal axes by an upper bridge 5 and a lower bridge 6. The compartments 33 are arranged in a row next to each other with their axes in parallel and are positively connected together. Current conducting rods 4 are passed through the compartments 33 along the longitudinal axis 37 (see Figure 3) and then the compartments are at least partially filled with an active electrochemical medium 1.

In the separators or box plates according to the state of the art the compartments are formed as actual hoses. In the embodiment shown in Figure 2

the hose is in practice of right circular cross-section although lately hose rows have been employed with a cross-section which is rectangular but with rounded corners. However, for all known box plates or separators, independently of their actual hose cross-sections, it is true to say that the compartments 33 are genuine hoses and that their interior space is completely surrounded by a closed mantle surface.

From Figure 3 it may be seen that the separator or box plate 2 embodied in the invention has compartments 33 and 33' continuously bounded by two closed walls which are parallel with each other and with the longitudinal axes 37 of the compartments 33 and 33'; these walls are designated herein "first wall 31" and "second wall 32". Similarly a closed wall surface closes the edge compartments 33' of the plate 2 and these walls are designated "sidewalls 38". The sidewalls 38 are parallel with the longitudinal axis 37 of the edge compartments 33' and perpendicular to the first wall 31 and to the second wall 32. Within the interior of the box plate or separator 2 enclosed by the first wall 31, the second wall 32 and the sidewalls 38, and between any pair of adjacent compartments 33 and 33' there are respective diaphragms 3 running perpendicularly to the first wall 31 and the second wall 32; these diaphragms 3 are so formed that they interconnect the first wall 31 and the second wall 32 at a predetermined spacing 36 along the common boundary plane. The diaphragms are constituted by strips or threads 15. The spacing between the first and second walls 31, 32 is designated by the reference number 35.

In this way the active medium 1 filled into the compartments 33 and 33' of the box plate or separator 2 forms in effect a continuous medium but cannot pass out from the said interior because of the continuous nature of the walls 31, 32 and 38 when the unit is assembled together to form an electrode, held together by the upper bridge piece 4 and the lower bridge piece 6. The spacing 34 (Figure 3c) of the strips or threads 15 forming the diaphragm 3, taken along the longitudinal axis 37, represents the pitch or spacing of the stitches of the threads, either woven or sewn "a jour" and this pitch or distance is chosen in accordance with the desired size of the electrode plate and optionally in dependence upon other parameters. Its value may for instance range from 1 to 10 mm. such a stitch density on the one hand assures adequate rigidity so that the diaphragms 3 maintain the first wall 31 and the second wall 32 at the desired distance 35 corresponding to the desired plate thickness, while on the other hand when the active medium 1 is filled into the unit 2, it can easily pass between the gaps of the diaphragm 3 set by the spacing 34.

In Figures 4 and 5 the path of the warp threads 8 forming the lower fabric branch 11a of the double fabric are shown by chain-dotted lines employing a single dot, while that of the warp threads 8 forming the upper branch 11b of the fabric are shown by a chain-dotted line employing two dots, the threads 15 forming the diaphragms 3 being shown with a full line. The warp threads are unwound from a thread roll or beam 7 and are passed through a heddle

frame 9 and a reed member 10 to weave a closed double fabric 11 provided with sidewalls 38 in which, under the effect of an internal force play, the lower fabric layer 11a and the upper fabric layer 11b tend to try to spread out from each other but by means of adjustable limiting and guiding elements 12 are maintained at the spacing 35 required in accordance with the desired plate thickness, see Figure 3.

The individual threads 15 to be woven-in to establish the diaphragms 3 are guided from thread spools 16 via a finely adjustable thread braking mechanism 17 and guide rolls 18, 19 and 19a which assure an appropriate free thread length and which are mounted on a frame, through the heddle frame 9 which has open thread guides 9a for this purpose, then through the reed member 10 and finally, at a spacing appropriate to the spacing 36 of the compartments 33, 33' (Figure 3), they are individually passed through to be woven together with the fabric branches 11a and 11b maintained at the desired distance 35; in this way the desired pitch or spacing 34 of the threads 15 measured along the longitudinal axis 37 is assured. Thus, the connecting threads 15 form diaphragms included in the double fabric which is taken up on a fabric take-up roll 14 after passing around an auxiliary roll 13.

The apparatus shown in Figure 6 differs from the apparatus shown in Figure 4 in that the spacing 35 between the two fabric branches 11a and 11b of the double fabric 11 is determined by the thickness of core insert elements 20. The bounding and guiding elements 12 are adjusted in a horizontal direction to a value less than the thickness of the auxiliary roll 13. In this way, the core inserts 20 remain in the same place within the double fabric 11 during weaving and more particularly within the compartments 33, 33' bounded by the diaphragms 3, as the double fabric 11 continuously advances to be woven. The undesirable frictional force can be decreased by not placing an insert 20 in the path of advance of every compartment 33, 33'. The insert elements 20 are therefore located in the track or path section encompassed by the peripheries of the compartments 33, 33'.

On the basis of the above description the operation of the apparatus should be clear to a man skilled in the art. The warp threads 8 are stored in the usual manner on a warp thread supply roll 7 and are unwound from it against the biasing action of a frictional brake, to be woven into a double fabric 11. The warp threads 8 are threaded into the heddle frame 9 in such a manner that at a spacing or pitch 36 determined from the width of the compartments 33 of the fabric based separator empty or open thread guides 9a are left. After passage through the reed, the weaving of the double fabric 11 is fully prepared. Thereafter the bounding and guiding elements 12 are adjusted in a horizontal direction in such a manner that the reed 10 should not abut them in its end positions.

The vertical spacing between the individual bounding and guiding elements 12 is so adjusted that, in dependence on the spacing 35 i.e. on the thickness of the plate, the desired length of the thread 15 forming the diaphragm 3 should be assured. Thereafter the threads 15 taken off the thread spools 16 are

passed through the thread braking mechanism 17, the adjusting rolls 18 and 19 and then are threaded into the open thread guides 9a in such a manner that in the gaps of the teeth of the reed 10 the excess thread length required for the height of the diaphragm should be assured.

The semi-finished product in the form of the double fabric 11 is finished by means of a thermosetting treatment in a manner known per se and which may be performed, for example, in accordance with the disclosure of Hungarian Patent Specification No. 162023 or an improvement thereof disclosed in Hungarian Patent Application No. 1288/80.

The advantages and disadvantages of forming the box plate or separator from web material are known in the art but if it is desired to make such web material-based box-plate, then the method to be followed is illustrated in Figure 7. The production of web sheets may be effected by any of the means known in the state of the art to form the raw box-plate (separator) material in the form of web sheets 22 mutually superposed on each other. These web sheets 22 are then loosely sewn together by a double-stitch industrial sewing machine. The diaphragms 3 are formed from acid-resistant sewing thread. Their mutual distance 34 chosen according to criteria already described is assured by the appropriate setting of the density (spacing) of the stitches. The height of the diaphragms 3 and thus the distances between the upper and lower web sheets 22 forming the first and second walls 31 and 32 in the assembled condition are assured by adjusting, with the aid of the friction brake of the sewing machine, the thread length provided for each stitch and corresponding to the distance 35 determining the thickness of the plate. The pitch or spacing 36 of the diaphragms 3 is assured by adjusting the spacing between the individual sewing heads of the sewing machine. The sidewalls 38 are produced not by the stitching density according to the distance 34 but rather by adjusting the stitching density at the sewing heads that sew the side walls 38 in such a manner that the resulting wall will have the same density as the fabric based first and second walls 31 and 32. Thus during sewing the two web branches, the upper and lower branches 22 still lie one on top of the other and it is the excess thread length for each stitch which enables the formation of the internal space in accordance with the spacing 35 between the walls 31 and 32 when the medium 1 is filled in.

Amongst the advantages afforded by the present invention one should mention primarily the fact that the inactive volume ratio calculated on the plate volume and plate weight is significantly lower than in the box plate or separator according to the state of the art. Thus the specific output is correspondingly improved and economies can be achieved in the amount of material required for making the separator or box plate, to a lesser extent, also in the amount of active medium 1 being used, while maintaining the same service life.

A further specific saving in material is rendered possible by the more favourable geometry of the construction. The active medium 1 is disposed in the compartments 33 and 33' bounded by the planar

walls 31 and 32 and the diaphragms 3 extending in planes parallel to those walls in such a manner that along its full width the plate or electrode forms a practically homogeneous continuous mass. The improvement in the technical parameters of the plate or electrode may be particularly significant in the case of high current loads.

The electrode plate according to the invention enables batteries or accumulators to be used in new fields of application such as vehicles employing electrical traction because for a given volume and weight the length of vehicle travel that can be achieved with one charge is increased and calculated on the useful output of the vehicle the 'idle run output' arising from the energy required to transport the mass of the accumulator or battery is decreased.

The characteristics of the electrode according to the invention make a more advantageous manufacturing process possible in which the labour requirement is decreased in every phase of the manufacture and the productivity of the existing machines can be suitably increased.

Thus for instance in the weaving of the double fabric, for the same technical and overall parameters the rate of thread consumption is reduced by approximately 30% in relation to the state of the art. Since the pitch 36 of the compartments 33 is smaller than the pitch of the compartments 23 shown in Figure 2, for the same cross-section, (in the weaving of the hoses according to Figure 2 the pitch is given by the developed width of half the circular arc which exceeds the pitch 36 of the equivalent compartment 33) significantly less warp thread is used and therefore for a weaving machine of the same dimensions approximately 50% more rows of compartments 33 can be woven within the same time.

A further advantage of the invention is that the weaving takes place 'in space' whereby the friction during manufacture between the individual warp threads to be woven into the two fabric branches 11a and 11b is much lower and hence wear is reduced and the number of faults is also decreased.

In correspondence with the reduction of about 30% in the consumption of thread the requirement for impregnating material is also reduced and as a consequence of the reduction in width the productivity of the impregnating machine increases in like proportion. Since the walls 31 and 32 are in practice completely planar a more uniform impregnation density may be achieved.

The thermosetting of the double-fabric advancing in a plane parallel with the longitudinal axes of the compartments is performable also under more favourable conditions; the width of the raw double fabric before thermosetting essentially corresponds with the width of the final product, the box plate, while in contrast with the double fabric woven in the traditional manner in one plane, in the case of the box made from rows of hoses, has a width greater than the finished box plate by the difference between half the circumference and the diameter. In the case of utilising the already mentioned conventional machinery for performing the process according to the invention a productivity gain of about 50% can be achieved, together with significantly lowered fric-

tional resistance and a box plate of improved quality free from deformations. Naturally, the reduction in volume and weight also result in reduction in transport costs while the improvement in productivity brings with it a reduction in investment costs and economies in operational power requirements, whereby the outstanding economy of the process according to the invention is still further improved.

CLAIMS

1. Lead battery electrode (so-called box-type positive electrode plate) which has a boxed plate or separator made from plastics material and finished by a thermosetting process, the boxed plate or separator comprising a plurality of discrete compartments arranged next to each other in a row with mutually parallel axes and positively connected together, current-conducting rods threaded through the compartments in parallel with the longitudinal axes of the compartments, an electrochemical active medium filled into at least some of the compartments and upper and lower bridge pieces closing the compartments at the top and bottom in planes perpendicular to the longitudinal axes of the compartments, wherein the boxed plate or separator is closed in a first plane and in a second plane, which planes form a continuous boundary for all said compartments and which are parallel with each other and with the longitudinal axes of the compartments, by a first wall and a second wall, respectively, each of said first and second walls being constituted by a continuous plastics member made either from a fabric or from web or tissue material, while in a third plane and a fourth plane externally bounding the edge or ends one of said compartments a respective sidewall extending in parallel with the longitudinal axis of the compartments and perpendicularly to the first and second walls connects the first and second walls together, and within the resulting enclosed internal space and between any pair of adjacent compartments there is a respective diaphragm extending in parallel with said longitudinal axis of the compartments in planes perpendicular to the first and second walls, the diaphragms being constituted by strips of threads formed along the common boundary planes of the compartments interconnecting the first and second walls at predetermined intervals.

2. An electrode according to claim 1, wherein each diaphragm is formed along the common boundary plane by a single thread passing along by a hem stitch (a jour attachment).

3. A process for producing a boxed plate or separator for an electrode according to claim 1 or claim 2, by utilising weaving and thermosetting, said process comprising unwinding warp threads from a warp supply roll or beam, weaving said threads into a 'double fabric' comprising spaced upper and lower fabric branches and continuously winding the double fabric as a raw product on a take-up roll, wherein at the instant of formation of the fabric the tendency of the fabric to spread apart due to an internal force effect of the upper and lower fabric branches advancing approximately mutually in parallel is limited to a constant value corresponding to the thickness of the plate to be produced by bonding and

guiding elements, and optionally core inserts and in the plane of the location of said limiting elements the upper and lower fabric branches are connected together at a pitch distance corresponding to the width of the compartments in such a manner that in a plane parallel with the longitudinal axis of the compartments threads are woven into the two fabric branches at a predetermined spacing along the said longitudinal axis.

4. A process for producing the boxed plate or casing of an electrode according to claim 1 or claim 2 from web or tissue material, in the course of which the raw (semi-finished) product is finished by thermosetting, comprising producing sheets of web or tissue material in a per se known manner in the form of upper and lower branches to form upper and lower walls, continuously advancing the upper and lower web or tissue branches while guiding them in a parallel orientation through a sewing machine, sewing the branches together along a direction of advance corresponding with the longitudinal axis of the compartments, by means of sewing heads arranged at a spacing corresponding to the width of the compartments in such a manner that by appropriately adjusting the friction brake of the sewing machine the thread length per stitch is assured in accordance with the distance determining the thickness of the plate and by means of sewing head arranged at the limiting planes the stitch spacing is adjusted or set suitably for the pitch required for the air gaps of the diaphragms and the sewing heads arranged at the external boundary planes for the edge compartments dense stitching is provided.

5. Apparatus for production of the box-type plate or casing for an electrode according to claim 1 or claim 2 comprising a thread supply roll, a heddle frame, a reed, an auxiliary roll and a fabric take-up roll, wherein the path section between the reed and the auxiliary roll bounding and guiding elements are arranged which are provided with vertical and horizontal adjusting means while in the track section before the heddle frame, expediently in the vicinity of the thread supply roll thread spools are arranged downstream of which along the direction of advance a thread braking mechanism and guiding rolls are located.

6. Apparatus according to claim 5, wherein in the path section between the reed and the guiding and bounding elements at least along a portion of the path of advance of the individual compartments (e.g. in the paths of advance of every second compartment) core inserts are arranged in the space to be encompassed by the periphery of the compartments.

7. Apparatus according to claim 5, wherein in the track or path section between the reed and the bounding elements along at least a portion of the direction of advance of the individual compartments (e.g. in the path of advance of every second compartment), holding means are arranged for accommodating core inserts within the space encompassed by the periphery of the compartments and the apparatus is further provided with a set of core inserts arranged in a gradation expediently following the dimensions of a product.

8. Lead battery electrode substantially as herein described with reference to and as shown on the accompanying drawings, except Fig. 2.

9. A process according to claim 3, substantially as hereinbefore described with reference to and as shown in the accompanying drawings, except Fig. 2.

10. Apparatus according to claim 5 substantially as herein described with reference to and as shown in the accompanying drawings, except Fig. 2.

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