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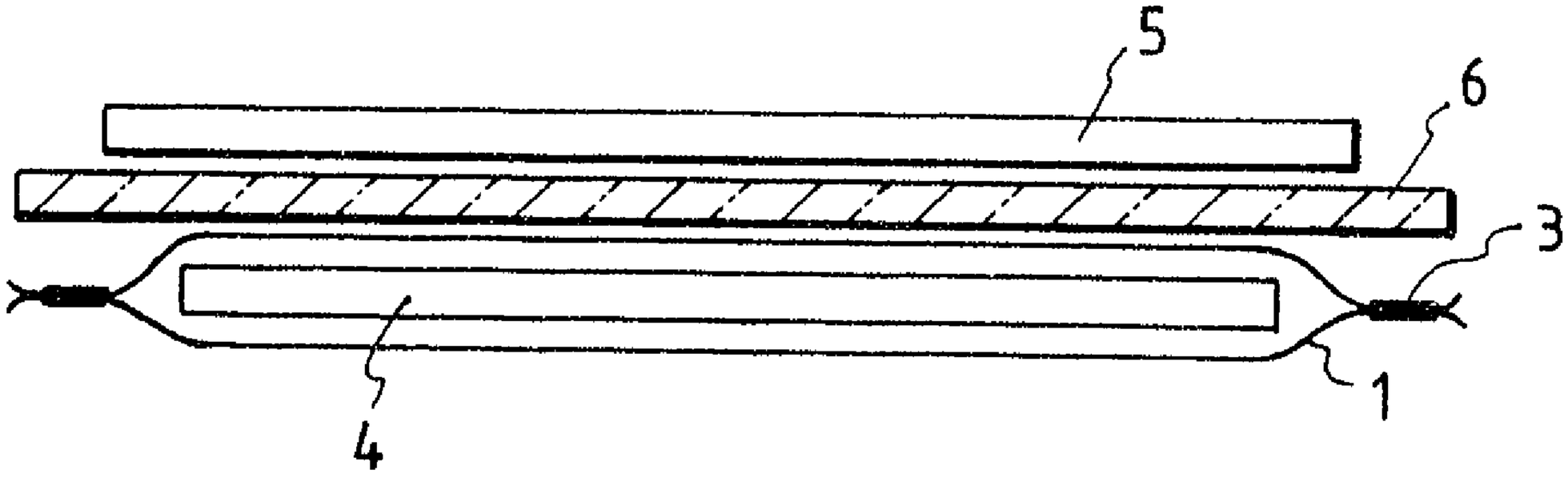
(54) Title: LEAD ACID STORAGE BATTERY



(57) Abrégé/Abstract:
A lead acid storage battery comprises a group of electrode plates. A negative plate is enclosed in an envelope separator joined together at its both edges by welding or mechanical sealing. A glass mat is separately provided between the separator and a positive plate. The glass mat has a width at least equal to the width of the separator except its both edges.

ABSTRACT OF THE DISCLOSURE

A lead acid storage battery comprises a group of electrode plates. A negative plate is enclosed in an envelope separator joined together at its both edges by welding or mechanical sealing. A glass mat is separately provided between the separator and a positive plate. The glass mat has a width at least equal to the width of the separator except its both edges.

LEAD ACID STORAGE BATTERY

The present invention relates to lead acid storage batteries.

Existing lead acid storage batteries comprise a positive plate or plates and a negative plate or plates with a separator plate or plates located between. Separators are provided with glass mats. These separators are now generally referred to as a planar separators. Another type of separator, recently introduced, is of a synthetic resins, for example, polyethylene. Owing to their thinness, the polyethylene separators have the merit of being lower in electrical resistance and better in oxidation resistance than the conventional separators.

The polyethylene separator is longitudinally folded with a glass mat pre-laminated on it to form an envelope. The envelope is then joined together at its both edges by welding or by mechanical seals. If the glass mat extends to the welds, then welding or mechanical sealing is not feasible. For this reason, a glass mat smaller in width than the welds of the separator is used, i.e. a glass mat having a width such that its widthwise edges do not reach the welds.

With such a narrow glass mat, however, the positive plate is curved into contact with the polyethylene separator when the lead acid storage battery is used under severe conditions. This leads to deterioration due to oxidation. There will be a short-circuit between the positive and negative plates.

The present invention seek to extend the service life of a lead acid storage battery constructed with an envelope separator made of polyethylene or other synthetic resin.

According to this invention, extension of the battery life is achieved by the provision of a lead acid storage battery comprising a group of electrode plates, wherein a negative plate is enclosed in a polyethylene envelope separator joined together at both edges by welding or mechanical sealing and a glass mat is separately provided between said separator and a positive plate, said glass mat having a width at least equal to the width of said separator except at its edges.

In one embodiment of this invention, the glass mat may be equal in width to the separator.

By locating the glass mat according to this invention, it is unlikely that the positive plate will curve into contact with the negative plate when the battery is in use. The service life of the positive plate can thus be increased.

The invention and the prior art are illustrated in the drawings in which:

Figure 1 shows one embodiment of the lead acid storage battery according to this invention, (a) and (b) being top and front views, respectively;

Figure 2 shows another embodiment of the lead acid storage battery according to this invention, (a) and (b) being top and front views, respectively;

Figure 3 is an illustration of the condition of the first embodiment after use;

Figure 4 is an illustration of the condition of the second embodiment after use;

Figure 5 shows a conventional lead acid storage battery, (a) and (b) being top and front views, respectively;

Figure 6 is an illustration of the condition of the conventional example after use; and

Figure 7 shows characteristic curves of the voltage

variation for the instant and conventional at 30 seconds during endurance tests.

Figures 5 and 6 show the prior art in use. A polyethylene separator, in Figure 5 is longitudinally folded together with a glass mat 2 pre-laminated thereon, to form an envelope. The envelope is then joined together at its edges 3 by welding or mechanical seals. However, if the glass mat 2 should extend to the welds 3, welding or mechanical sealing would not be feasible. For this reason, a glass mat smaller in width than the welds 3 of the separator, i.e. a glass mat having a width such that its edges do not reach the welds 3 is now used in combination with the separator 1. Figure 5 shows a negative plate 4 enclosed in the envelope separator 1 and a positive plate 5.

With such a narrow glass mat, however, the positive plate 5 would be curved into contact with the polyethylene separator as depicted in Figure 6, when the lead acid storage battery is used under severe conditions, leading to deterioration due to oxidation. At this portion shown at 1S, there will be a short-circuit between the positive and negative plates 5 and 4.

Referring to Figure 1, there is shown one battery A_1 according to this invention, with a glass mat 6 located in it. As illustrated, the glass mat 6 has a width equal to that of a polyethylene envelope and is separately provided between the separator 6 and a positive plate 5.

Referring to Figure 2, there is shown another battery A_2 according to this invention, with a glass mat 7 located in it. The glass mat 7 has a width smaller than the polyethylene separator 1, the difference being the width of the edges 3 joined together. The mat 7 is separately provided between the separator 1 and a positive plate 5.

With the batteries A_1 and A_2 there is no possible short-circuit between positive and negative plates 4 and 5. This is because, as illustrated in Figures 3 and 4, the glass mats 6 and 7 are located all over the surfaces of the positive and negative plates 4 and 5, even then the positive plates 5 are curved during use under severe conditions.

The instant batteries will now be compared in terms of service life with a conventional battery B in which, as shown in Figure 5, the glass mats are integrally placed over a polyethylene enveloped separator except its both edges, all having a capacity of 12V, 5HR and 48Ah.

An endurance test was performed at 75°C with charging at 14.8 V for 10 minutes and discharging at 25 A for 4 minutes.

Figure 7 shows how the discharge voltages of the batteries vary at 30 seconds.

It can be seen from Figure 7 that the instant batteries A_1 and A_2 show a 50% increase in terms of service life, as compared with the conventional battery B.

Thus, the present invention is effective for extending the service life of batteries.

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A lead acid storage battery comprising a group of electrode plates, wherein a negative plate is enclosed in an envelope separator joined together at its both edges by welding or mechanical sealing and a glass mat is separately provided between said separator and a positive plate, said glass mat having a width at least equal to the width of said separator except its both edges.

2. A lead acid storage battery as claimed in Claim 1, wherein said glass mat is equal in width to said separator.

FIG. 1(a)

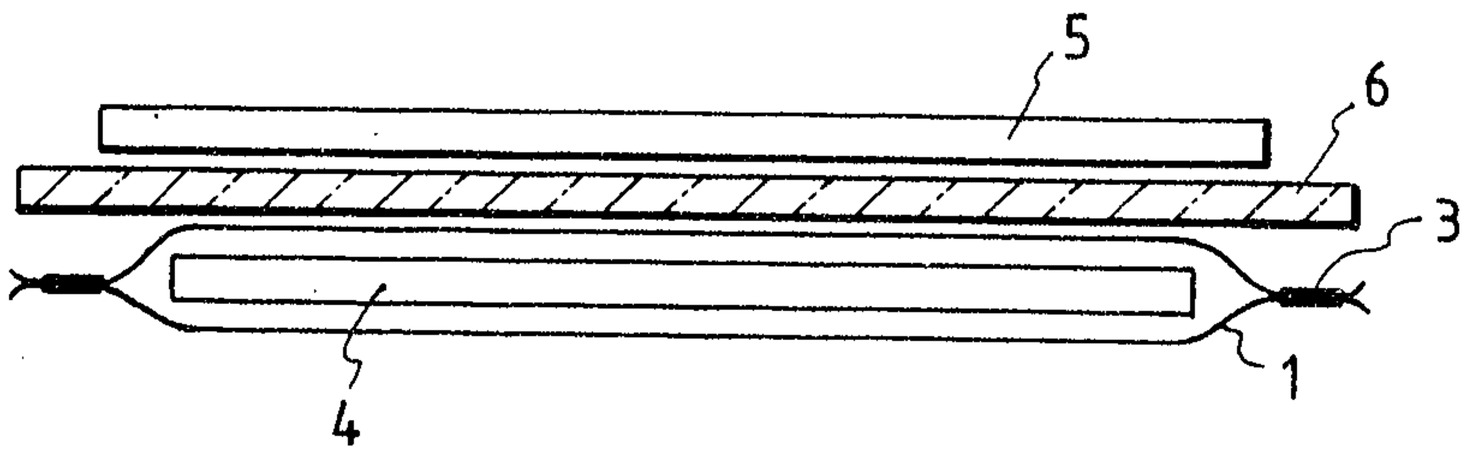


FIG. 1(b)

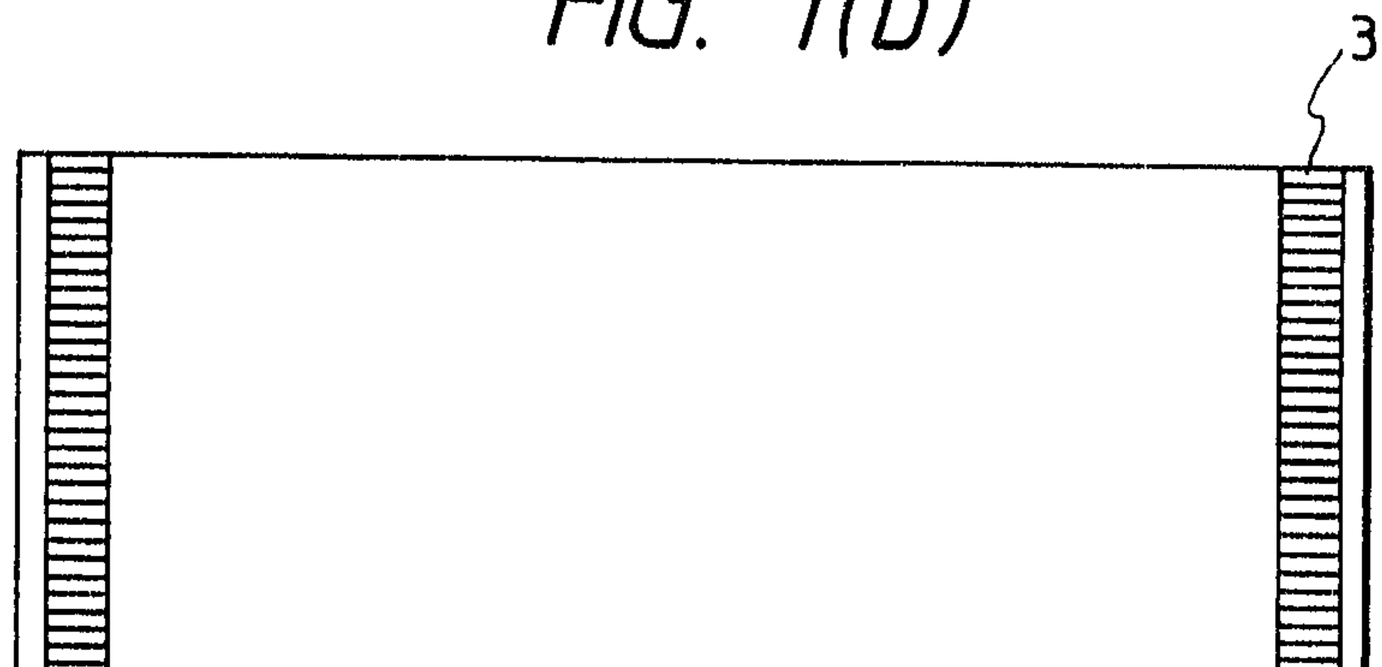


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FIG. 2(a)

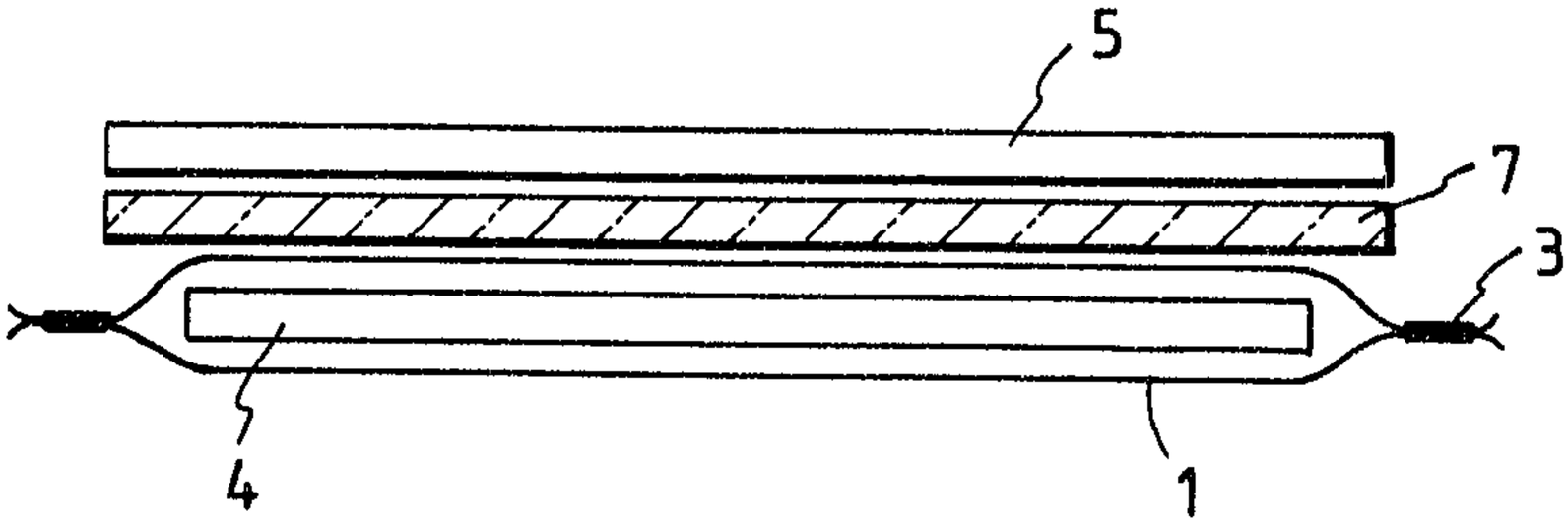

FIG. 2(b)

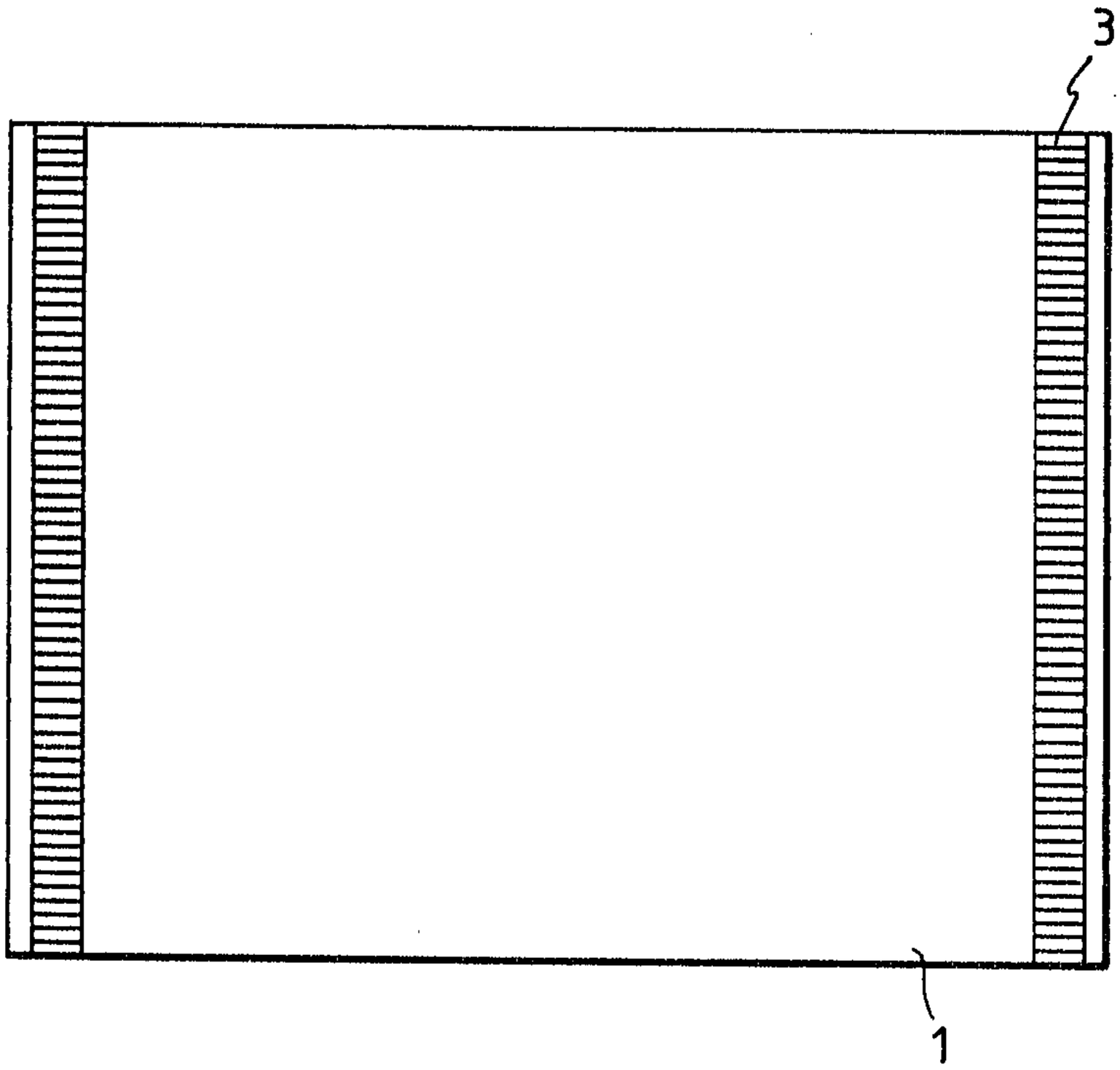

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FIG. 3

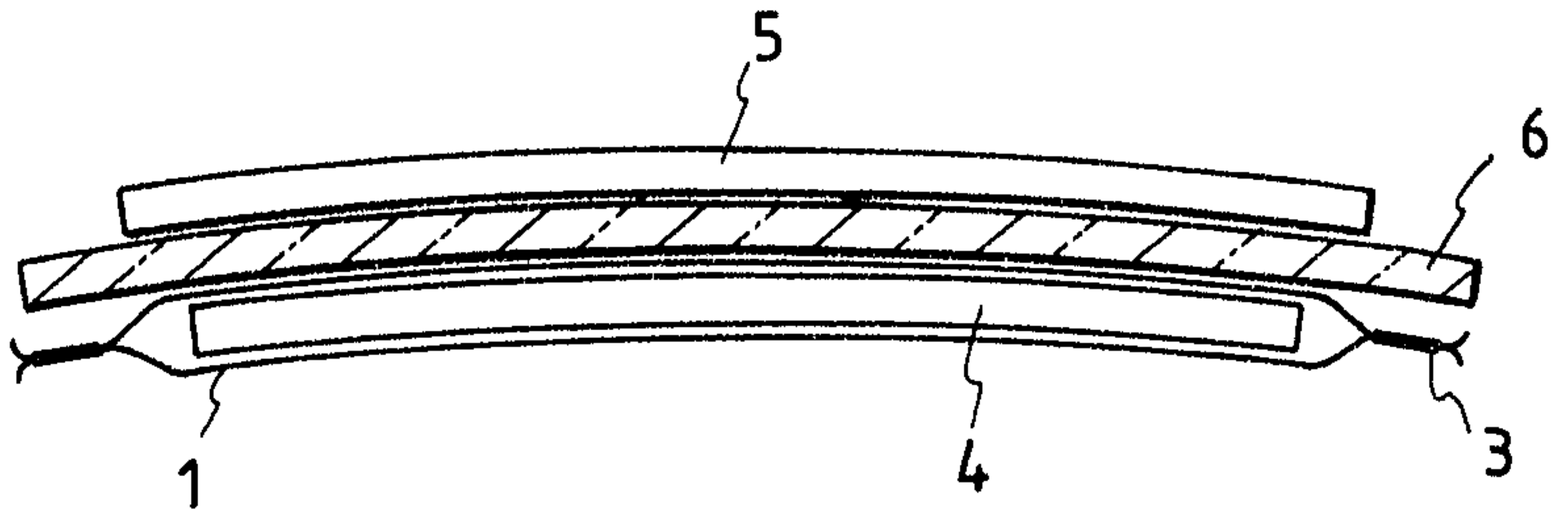

FIG. 4

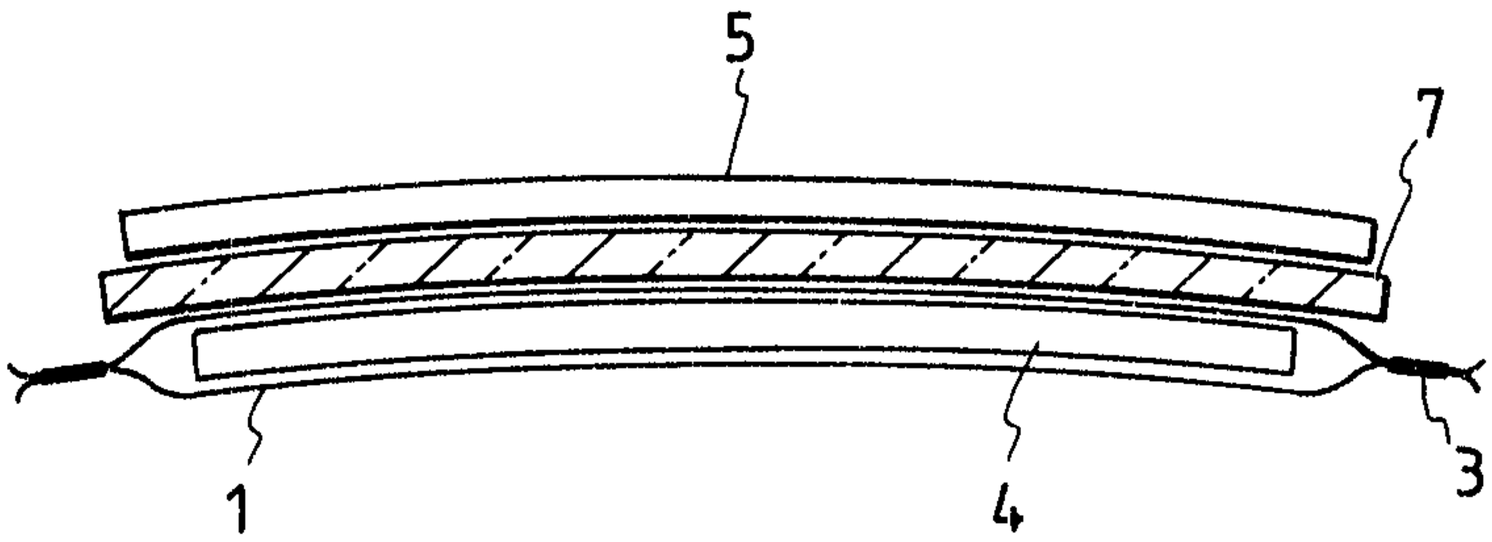

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FIG. 5(a)

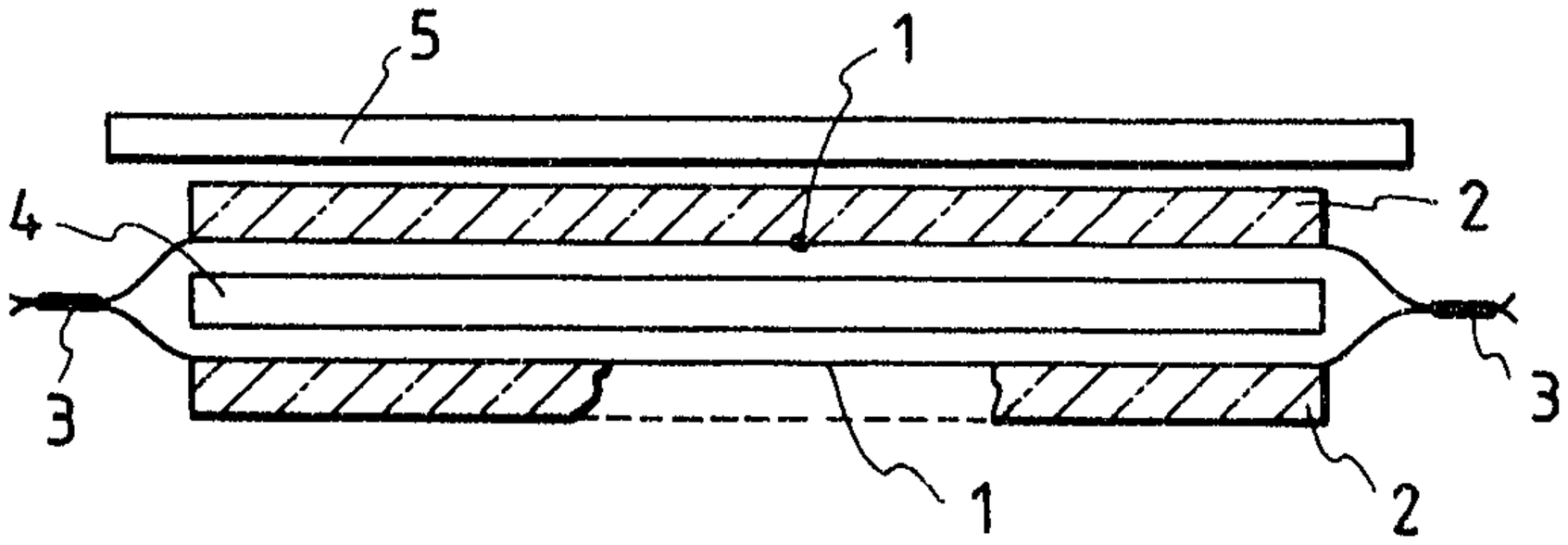

FIG. 5(b)

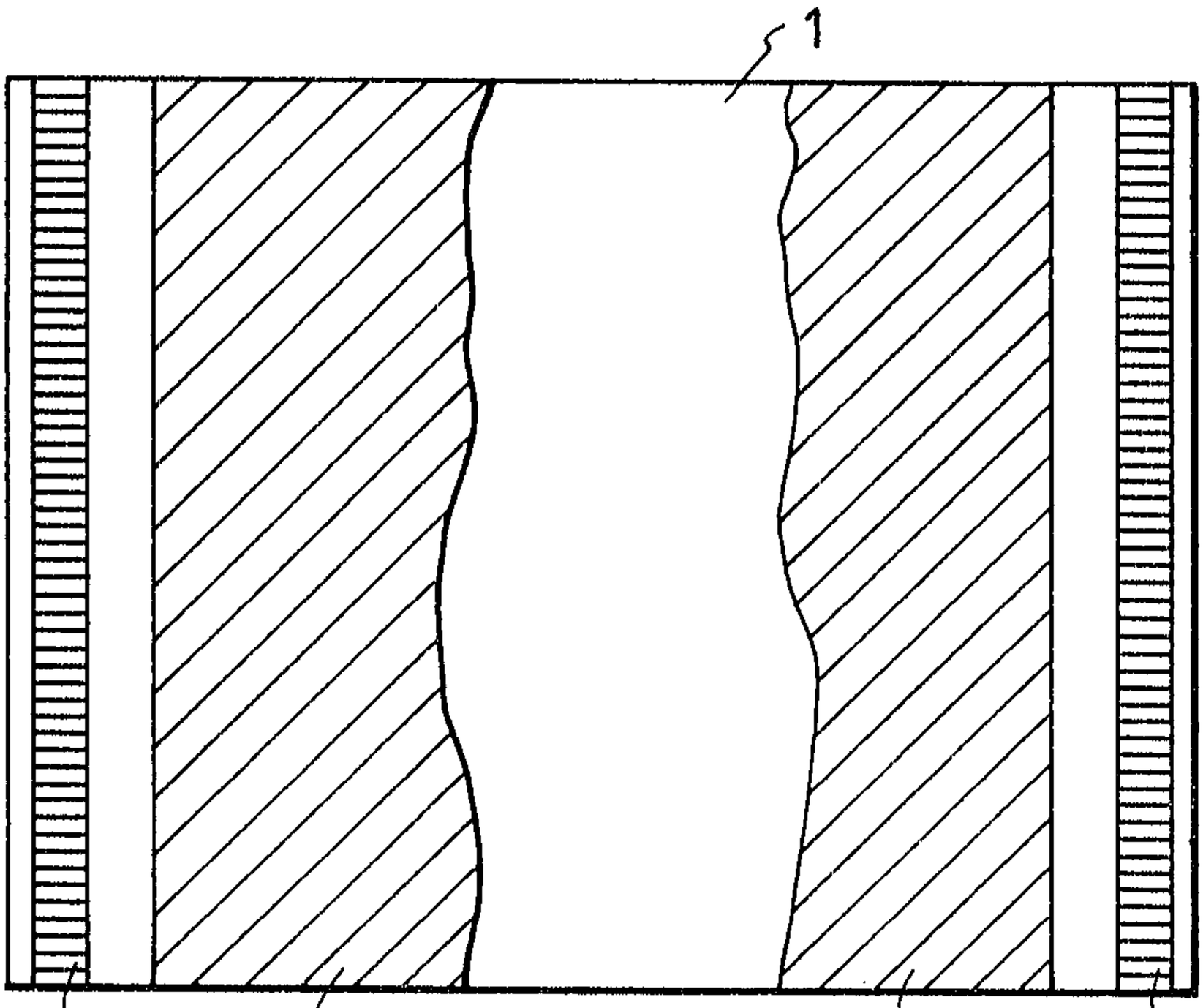

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FIG. 6

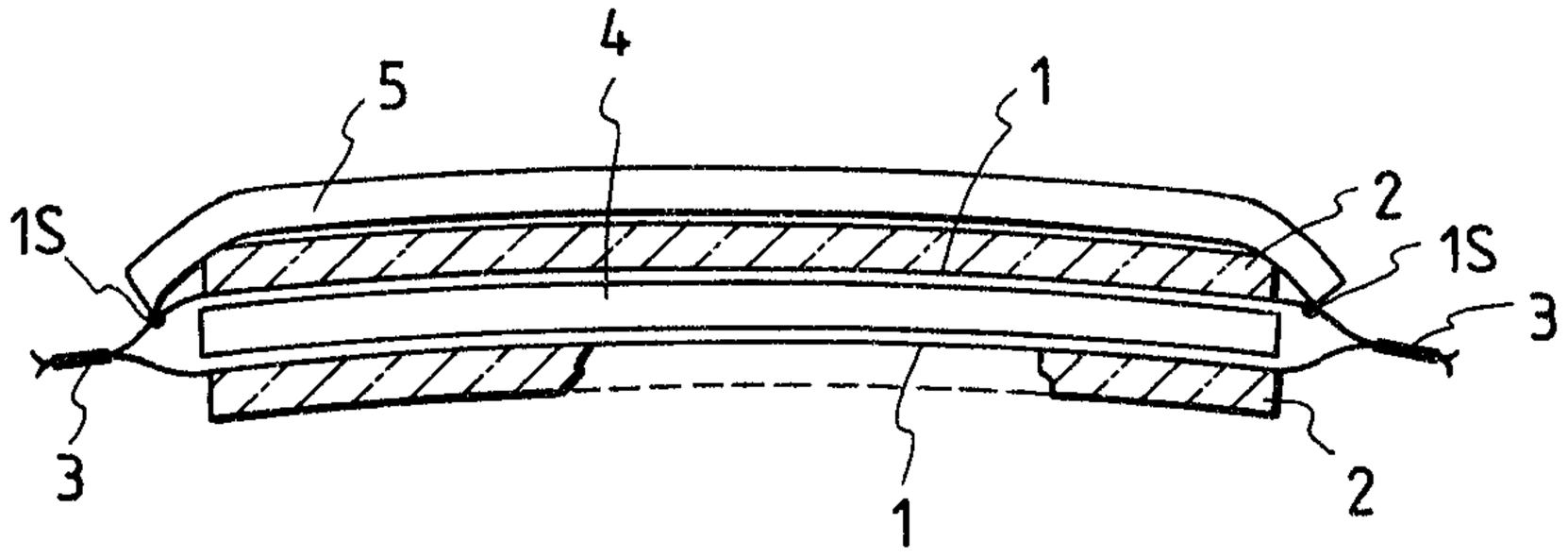
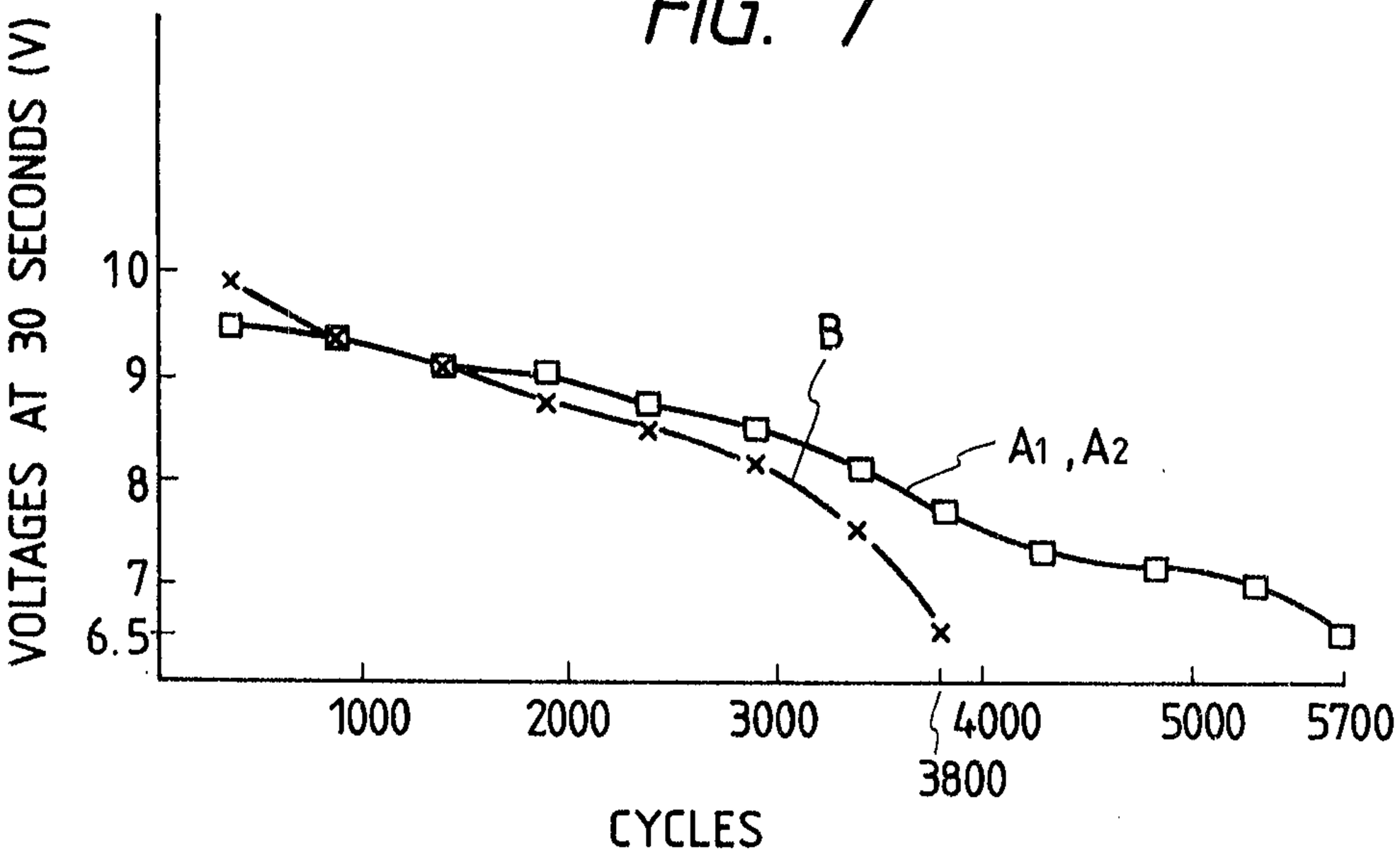


FIG. 7



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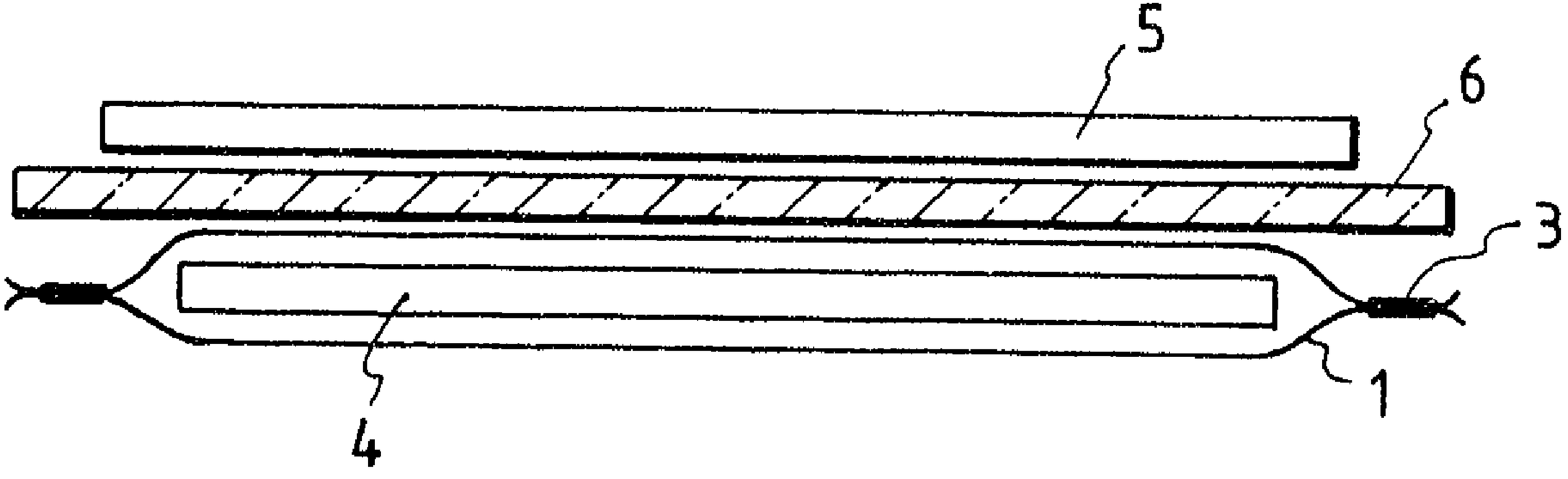
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