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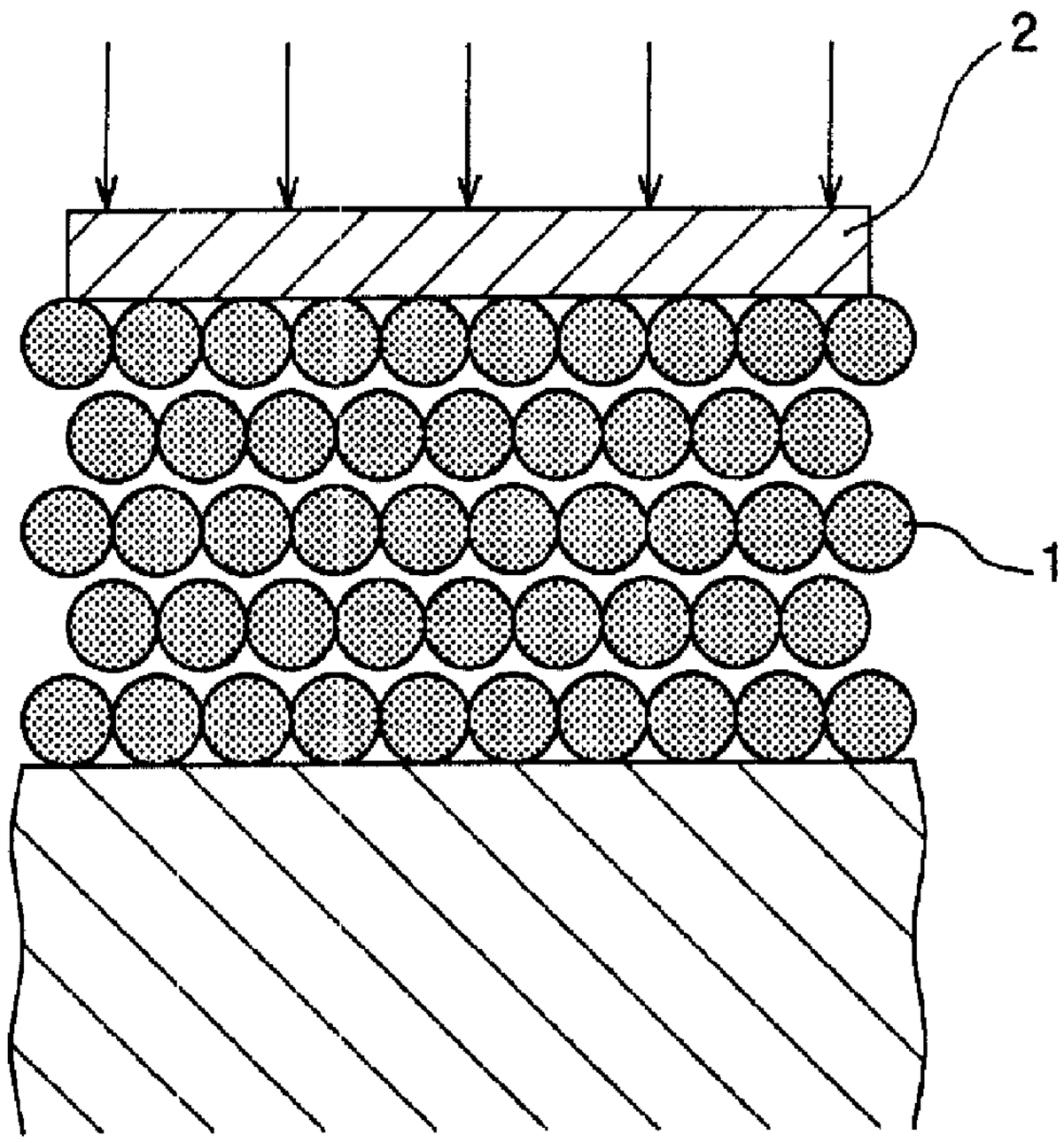
(54) Titre : COUCHE DE SABLE POUR LA CULTURE DE PLANTES AQUATIQUES ET AQUARIUMS UTILISES POUR LA CULTURE DE PLANTES AQUATIQUES DANS UNE COUCHE DE SABLE

(54) Title: BOTTOM SAND FOR GROWING AQUATIC PLANTS AND AQUARIUMS FOR GROWING AQUATIC PLANTS USING BOTTOM SAND



(57) Abrégé/Abstract:
Bottom sand for growing aquatic plants containing a granular sinter consisting essentially of volcanic ash and having a bonding strength to collapse when a pressure of 2.5 kg/cm2 or above is applied on a 1.0 cm thick layer. This bottom sand permits good filtration of water and satisfactory growing of aquatic plants. Aquariums using such bottom sand purifies the water contained in it and assures satisfactory growth of aquatic plants placed in it.

Abstract

Bottom sand for growing aquatic plants containing a granular sinter consisting essentially of volcanic ash and having a bonding strength to collapse when a pressure of 2.5 kg/cm^2 or above is applied on a 1.0 cm thick layer. This bottom sand permits good filtration of water and satisfactory growing of aquatic plants. Aquariums using such bottom sand purifies the water contained in it and assures satisfactory growth of aquatic plants placed in it.

SPECIFICATION

Title of the Invention

Bottom Sand for Growing Aquatic Plants and Aquariums for Growing Aquatic Plants Using Bottom Sand

Background of the Invention

This invention relates to bottom sand for growing aquatic plants in aquariums and aquariums for growing aquatic plants using such bottom sand.

Recently hydroponics to grow plants in water contained in aquariums, sometimes with pet fish, has been popular.

In hydroponics, it is essential to circulate and filter water in order to prevent it from becoming turbid and opaque.

Meanwhile, the sand laid at the bottom of aquariums is required to serve as a medium to grow plants.

Nevertheless, there has been no technical concept to use such bottom sand in aquariums as can permit both efficient filtering of water and efficient growing of aquatic plants.

The object of this invention is to provide bottom sand that permits both efficient purification of water and efficient growing of plants and aquariums for growing aquatic plants using such bottom sand as illustrated in Fig. 3.

Summary of the Invention

To solve the problem described earlier, the bottom sand according to this invention contains granular sinter consisting

essentially of volcanic ash. The granular sinter has such a bonding strength that granules collapse when a pressure of 2.5 kg/cm^2 or above is applied to a layer of the sinter 1.0 cm thick. The aquarium according to this invention use the bottom sand of the type described above and have a water-circulating system installed therein.

Brief Description of the Drawings

Fig. 1 is a cross-sectional view showing a 1.0 mm thick layer of granular sinter consisting essentially of volcanic ash under a crushing pressure.

Fig. 2 graphically shows the relationship between the lapse of time and the level of illumination expressed in lux in Embodiment 1.

Fig. 3 is a front view of an aquarium of this invention containing the bottom sand laid at the bottom thereof. (The figure shows only that side of the water-circulating pipe which discharges water. The side of the water-circulating pipe which sucks in water below the filter is not shown.)

DETAILED DESCRIPTION OF THE INVENTION

As shown in FIG. 1, there is a 1.0 cm thick layer of granular sinter 1 consisting essentially of volcanic ash under a plate 2 applying a crushing pressure. In FIG. 3, the layer of granular sinter 1 is positioned above the filter 5 in an aquarium 6 having a water-circulating pipe 4 which discharges water and which sucks in water below the filter. Element 3 is the water pump associated with pipe 4 for sucking and discharging the water.

Sinter consisting essentially of volcanic ash prepared by combining fine particles of volcanic ash by sintering has fine pores at the surface thereof. The fine pores filter impurities adsorbed from the water. If the sinter has too high a bonding strength, however, the aquatic plants can neither penetrate their roots into the sinter nor, as such, absorb

nutrients therefrom.

Accordingly, it is essential that the sinter has such a bonding strength as to permit the aquatic plants to penetrate their roots into fine pores formed therein.

The sinter according to this invention permits satisfactory growth of aquatic plants in the aquarium when the bonding strength is 2.5 kg/cm^2 or under when it is laid in a thickness of 1 cm.

Now this invention will be described based on the results of experiments.

Three aquariums, 38 cm wide by 24 cm deep by 30 cm high in size, each containing 23 liters of water and having a bottom filter (the Bio Filter 45 manufactured by Nisso Co., Ltd.) and a 2.5 cm thick layer of bottom sand consisting essentially of sintered volcanic sand, were prepared. The water was circulated at a rate of 1 liter per minute by using an air pump.

The granular sinters in the three aquariums a, b and c had a strength to collapse, when laid in a thickness of 2.5 cm, under a pressure of 2.0 kg/cm^2, 2.5 kg/cm^2 and 3.0 kg/cm^2, respectively. Parsley and watercress were grown in the aquariums.

The growing conditions of the plants are shown in the following table. (The weights shown are those of trunks and leaves, without including roots.)

Aquarium	a		b		c	
Plant	Weight at the start	Weight after 60 days	Weight at the start	Weight after 60 days	Weight at the start	Weight after 60 days
Parsley	4.5 g	48.5 g	4.4 g	43.7 g	4.5 g	38.7 g
Water-cress	5.3 g	59.0 g	6.0 g	51.3 g	5.9 g	37.7 g

As can be seen, aquatic plants can grow in aquariums when the sinter consisting essentially of volcanic ash has such a bonding strength, when laid in a thickness of 1.0 cm as shown in Fig. 1, as to collapse under a pressure of 2.5 kg/cm^2.

Essentially, the bottom sand according to this invention contains sinter consisting essentially of volcanic ash having a bonding strength of the level described above.

The bottom sand of this invention consists of either said sinter alone or mixtures of said sinter and other sand. The aquarium according to this invention comprises an aquarium containing said bottom sand laid at the bottom thereof, with a water-circulating system installed therein, as shown in Fig. 3.

Embodiments

Embodiments of this invention are described below.

[Embodiment 1]

When mixing sinter of volcanic ash with gravel, gravel itself has little water filtration function. Therefore, adding a certain proportion of the bottom sand according to this invention provides a satisfactory filtration function.

Six aquariums of the same design and size as those used

in the experiment described earlier were prepared and filled with 23 liters of water each. After adding 0.27 g of methylene blue, a dyeing agent, the bottom filter described earlier was laid.

Sinter of volcanic ash having such a bonding strength that a 1.0 cm thick layer of the granular sinter collapses under a pressure of 2.5 kg/cm^2 was mixed with gravel. Then, varying volume percentages of the sinter was mixed with gravel and the bottom sands thus obtained were placed in the bottom of the six aquariums to form a layer of approximately 2.5 cm. The volume percentages of the sinter are shown below.

Aquarium No.	Volume Percentage of Sinter
1	0
2	5
3	10
4	20
5	30
6	100

As in the experiment described before, the water was circulated at a rate of 1 liter per minute using an air pump. A beam of light was projected from one side of each aquarium 38 cm wide using a projector (the Pentax Slide 501 manufactured by Asahi Optical Co., Ltd.) having a light bulb of 100 watts at 100 volts and a projection lens of 72 mm diameter and 24 cm focal length. The luminous intensity was measured on the other side of the aquarium using an illuminometer that can measure the brightness between 0 and 200,000 lux.

The brightness of the light passing through each aquarium

changed with time as shown in the graph of Fig. 2.

When the sinter content was 0 percent, illumination scarcely changed. When the sinter content rose to 5 percent, the sinter absorbed methylene blue as water is circulated. This showed that water is purified by filtration. The degree of filtration and purification increased as the percentage of the sinter increased.

Thus, when the volume percentage of the sinter in the mixture of the sinter and gravel is 5 percent or more, sufficient levels of filtration and purification are achieved.

[Embodiment 2]

Generally volcanic ash contains a very small quantity of sulfuric acid.

When a mixture of volcanic acid and carbonate in alkali metals or alkaline-earth metals is sintered, sulfuric acid in the sinter gradually dissolves into water, whereas dissolution of the carbonate causes a buffer action that precludes a sharp rise of pH. This permits keeping constant the pH value in the aquarium for a long time.

To achieve the neutralization and buffering of sulfuric acid, the sinter should contain 0.2 to 1.5 weight percent of carbonate in alkali metals or 0.5 to 1.5 weight percent of carbonate in alkaline-earth metals.

Thus, this embodiment promotes the cultivation of aquatic plants while purifying water by keeping the pH value at an

appropriate level.

Effects of the Invention

As described above, this invention fulfills two indispensable requirements for aquatic plants; i.e., water purification and satisfactory growing.

Furthermore, aquariums using the bottom sand of this invention permits growing not only aquatic plants alone but also tropical fish, firefly or other aquatic animals, thereby adding to the ornamental effect.

Thus, this invention is a significant contribution to the growing and appreciation of aquatic plants and animals in aquariums.

CLAIMS:

1. A hydroponic growth support medium comprising granular sintered volcanic ash having a crushing strength not exceeding about 2.5 kg/cm^2 when applied to a layer of granular sintered volcanic ash 1.0 cm. thick.

2. The hydroponic growth support medium of claim 1 when the sinter has a crushing strength of from about 1 kg/cm^2 to about 2.25 kg/cm^2 when applied to a layer 1 cm thick.

3. The hydroponic growth support medium of claim 2 comprising gravel and wherein the sinter comprises at least about 5 volume percent of the growth support medium.

4. The hydroponic growth support medium of claim 1 wherein the sintered volcanic ash further comprises at least one member selected from the group consisting of from about 0.1 to about 1.5 percent by weight of an alkali metal carbonate and from about 0.5 to about 2.5 percent by weight of an alkaline earth metal carbonate.

5. The hydroponic growth support medium of claim 4 comprising gravel and wherein the sinter comprises at least about 5 volume percent of the growth support medium.

6. The hydroponic growth support medium of claim 1 comprising gravel and wherein the sinter comprises at least about 5 volume percent of the growth support medium.

7. An aquarium for growing aquatic plants containing growth support medium comprising:

a tank having sidewalls and a bottom wall;
a layer of bottom sand laid upon the bottom wall, the

bottom sand consisting of a granular sinter comprising sintered volcanic ash having a crushing strength not greater than about 2.5 kg/cm^2 applied to a 1.0 cm thick layer thereof;

a filter resting on the bottom sand and being covered by the bottom sand; and

a water circulating system coupled to the filter for water filtration through the filter.

8. The aquarium of claim 7 in which the growth support medium comprises a mixture of gravel and sintered volcanic ash, the sintered volcanic ash comprising at least about 5 volume percent of the mixture.

9. The aquarium of claim 8 wherein the sintered volcanic ash has a crushing strength of from about 1 kg/cm^2 to about 2.25 kg/cm^2 applied to a 1.0 cm thick layer of said sintered volcanic ash.

10. The aquarium of claim 8 in which the sintered volcanic ash contains at least one member selected from the group consisting of from about 0.1 to about 1.5 weight percent of an alkali metal carbonate and from about 0.5 to about 2.5 weight percent of an alkaline-earth metal carbonate.

11. The aquarium of claim 10 wherein the sintered volcanic ash has a crushing strength of from about 1 kg/cm^2 to about 2.25 kg/cm^2 applied to a 1.0 cm thick layer of said sintered volcanic ash.

12. The aquarium of claim 7 in which the sintered volcanic ash contains at least one member selected from the group consisting of from about 0.1 to about 1.5 weight percent of an alkali metal carbonate and from about 0.5 to about 2.5 weight percent of an alkaline-earth metal carbonate.

13. The aquarium of claim 12 wherein the sintered volcanic ash has a crushing strength of from about 1 kg/cm^2 to about 2.25 kg/cm^2 applied to a 1.0 cm thick layer of the sintered volcanic ash.

14. The aquarium of claim 7 wherein the sintered volcanic ash has a crushing strength of from about 1 kg/cm^2 to about 2.25 kg/cm^2 applied to a 1.0 cm thick layer of said sintered volcanic ash.

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FIG. 1

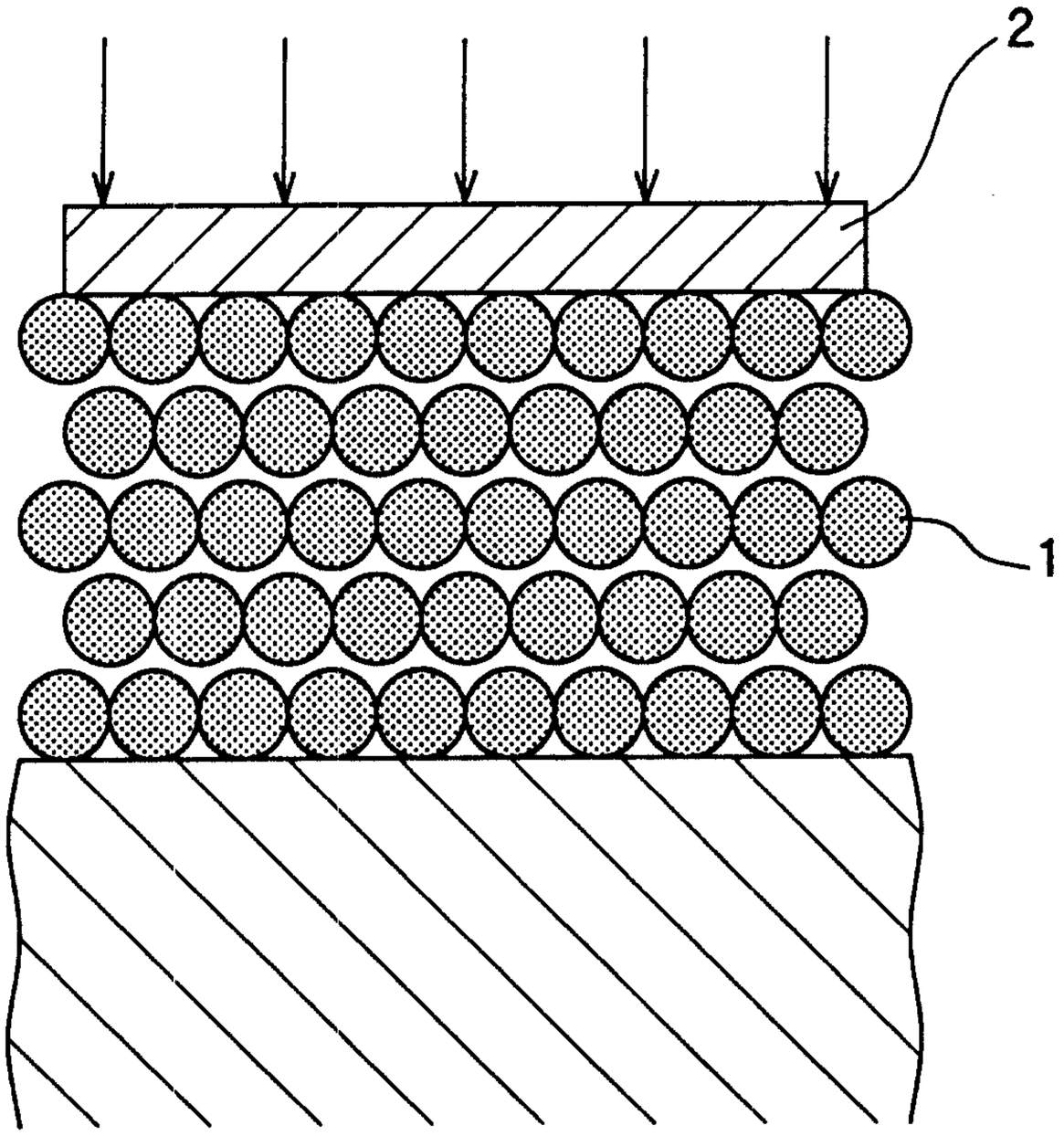

FIG. 2

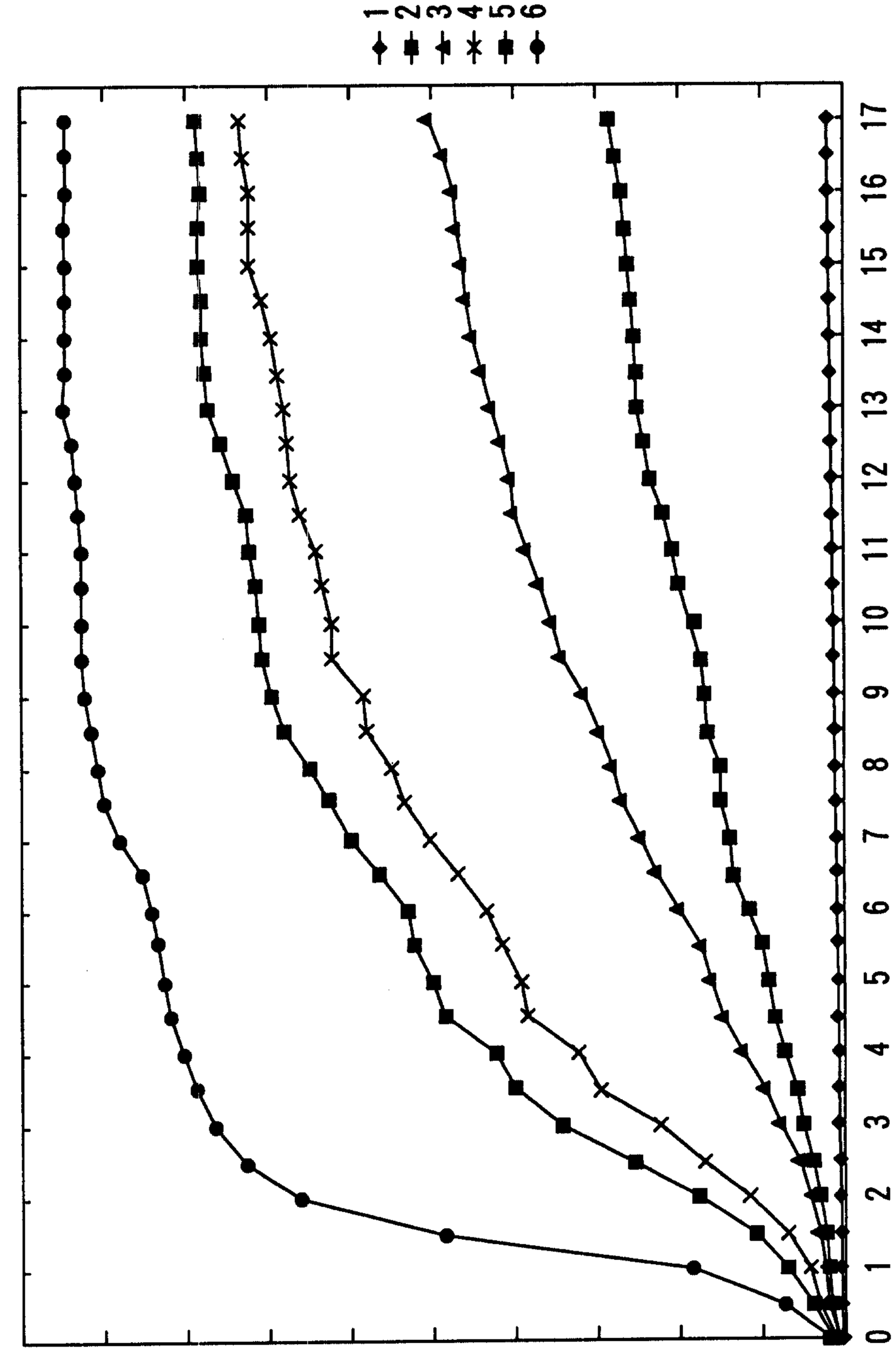
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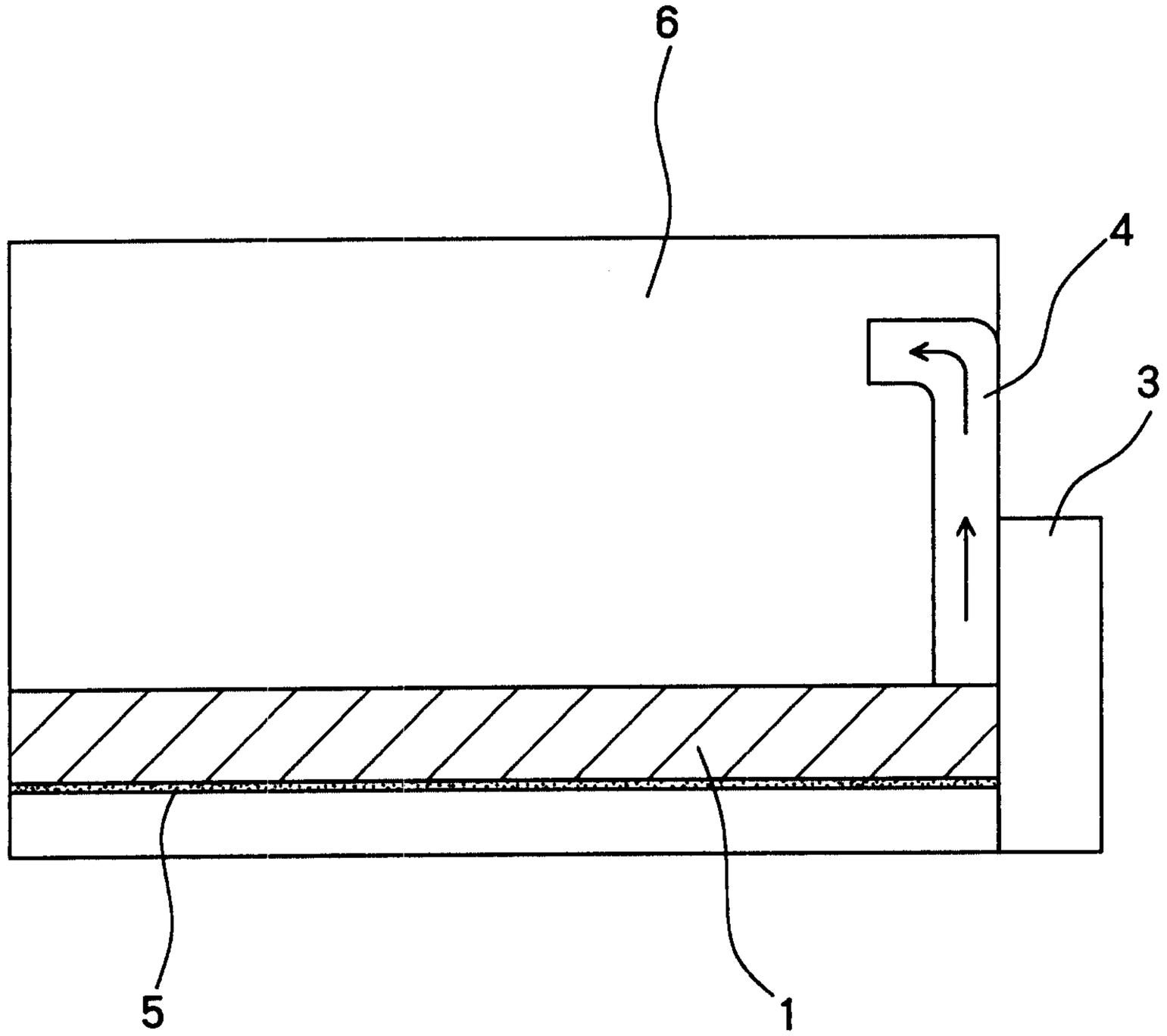
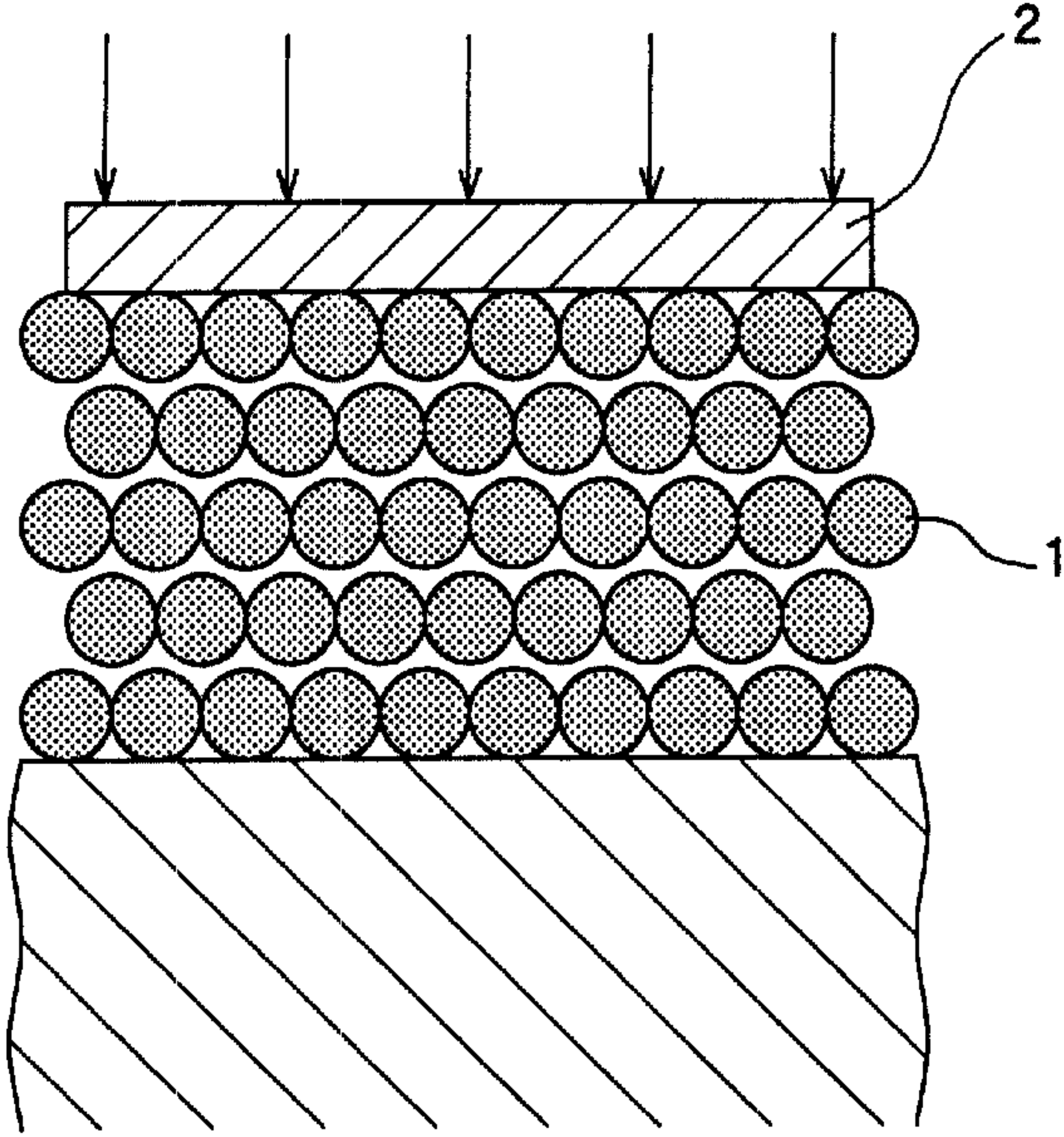
FIG. 3

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