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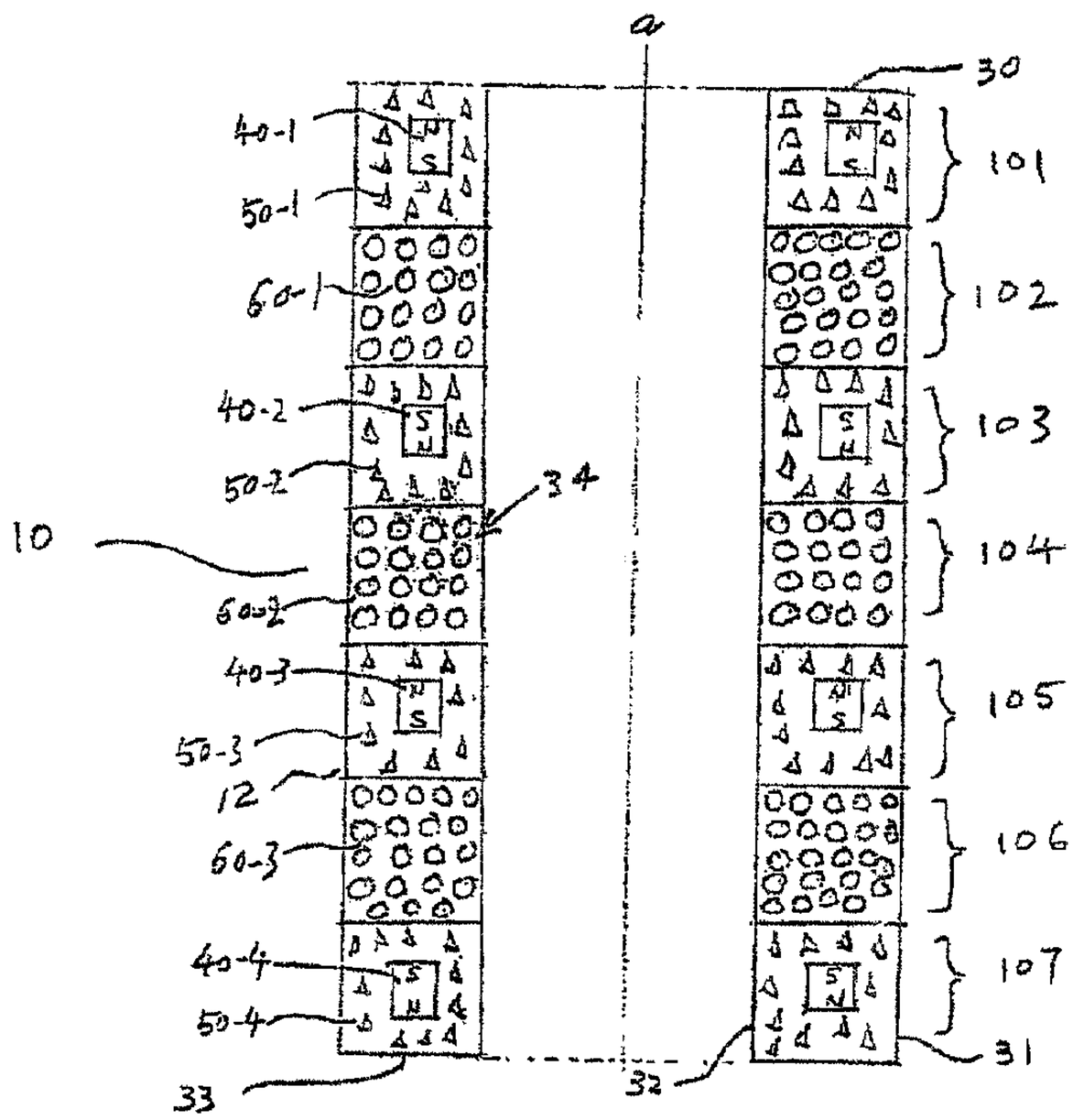
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(54) Titre : EPURATEUR D'EAU PRODUISANT UN CHAMP MAGNETIQUE
(54) Title: WATER PURIFIER HAVING MAGNETIC FIELD GENERATION



(57) Abrégé/Abstract:
A water purifier includes a filter having a cylindrical chamber formed with an inner wall, an outer wall and a bottom. A ceramic layer of granular ceramic particles and at least a pair of magnetic layers each comprising an annular magnet and magnetite particles are provided above or below the ceramic layer in the chamber. The annular magnets are arranged in such a way that the same polarities of adjacent annular magnets are facing each other, and the direction of the magnetic lines of force is parallel to the direction of flow of the water. Water molecules are activated while passing through the magnetic field produced by the magnetic layers of annular magnets and magnetite particles which are magnetized by the annular magnets.

ABSTRACT OF THE DISCLOSURE

[0034] A water purifier includes a filter having a cylindrical chamber formed with an inner wall, an outer wall and a bottom. A ceramic layer of granular ceramic particles and at least a pair of magnetic layers each comprising an annular magnet and magnetite particles are provided above or below the ceramic layer in the chamber. The annular magnets are arranged in such a way that the same polarities of adjacent annular magnets are facing each other, and the direction of the magnetic lines of force is parallel to the direction of flow of the water. Water molecules are activated while passing through the magnetic field produced by the magnetic layers of annular magnets and magnetite particles which are magnetized by the annular magnets.

WATER PURIFIER HAVING MAGNETIC FIELD GENERATION

BACKGROUND OF THE INVENTION

[0001] This invention relates to a water purifier and, more particularly, to a water purifier having a magnetic field generation device such as a permanent magnet.

[0002] Known in the art of devices for purifying tap water are devices which utilize granular activated carbon, etc. to remove residual chlorine and other impurities in the tap water. Also known are devices which have an additional function of adjusting the water quality such as pH by electrolytic treatment or by using an ion exchange resin. Also recently developed are devices which utilize infrared radiation or a magnetization treatment to activate water molecules.

[0003] U.S. Patent No. 5628900 discloses a water purifier including a filter having a cylindrical housing formed with a water inlet at one end and a water outlet on the other end and containing a granular activated carbon layer and a ceramic layer comprising granular ceramic, a magnetite layer comprising broken pieces of magnetite in a layer and provided at least above or below the ceramic layer, and annular magnets provided above and below the ceramic layer in such a manner that these annular magnets coincide with each other in the sense of magnetic lines of force and that the direction of the magnetic lines of force is parallel to the direction of flow of water. Water molecules are activated while passing through the magnetic field produced by the annular magnets and the magnetite layers which are magnetized by the annular magnets.

[0004] It is an object of the present invention to provide an improved water purifier capable of applying a magnetic field to water to be treated more effectively than the above described prior art water purifier and thereby removing residual chlorine in water to be treated more effectively.

SUMMARY OF THE INVENTION

[0005] In the present invention it has been found that the effectiveness of a magnetization treatment to activate water molecules depends on two major factors - how effective the water flow is through the magnetic field and the speed of water flow.

[0006] An annular magnet with or without a certain amount of magnetite forms a magnetic layer having a fixed strength of the magnetic field. The density of the magnetic field depends on the cross-section of the magnetic layer - the larger the cross section, the lower the density of the magnetic field. Vise versa, the smaller the cross section, the higher the density of the magnetic field.

[0007] For a fixed strength of the magnetic field of a magnetic layer - the density of the magnetic field is inversely proportional to the cross-section of the magnetic layer.

[0008] The effectiveness of a magnetization treatment to activate water molecules is proportional to the density of the magnetic field.

[0009] For a fixed water flow rate, the larger the cross section of the water flow, the lower the speed of the water flow.

Vice versa, the smaller the cross-section of the water flow, the higher the speed of the water flow.

[0010] For a fixed water flow rate - the speed of the water flow is inversely proportional to the cross-section of the water flow.

[0011] These may be expressed by the formula $E \propto 1 / C^2$ Where:

E is effectiveness of a magnetization treatment, and

C is cross section of the magnetic layer.

[0012] The effectiveness of a magnetization treatment to activate water molecules is also proportional to the speed of the water flow.

[0013] For an annular magnet with or without a certain amount of magnetite which forms a magnetic layer, if the cross section of the magnetic layer is reduced by half such that the density of the magnetic field is double and the speed of water flow is double, then the effectiveness of a magnetization treatment to activate water molecules is four (4) times better.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] In the accompanying drawings,

[0015] FIG. 1 is a vertical cross-sectional view showing a water purifier of a preferred embodiment of the present invention;

[0016] FIG. 2 is a vertical cross-sectional view showing a water purifier of the prior art; and

[0017] FIG. 3 is a vertical cross-sectional view showing a water purifier of the present invention as a preferred embodiment of a shower filter.

DESCRIPTION OF PREFERRED EMBODIMENTS

[0018] FIG. 1 is the vertical cross-sectional view of a preferred embodiment of water purifier which includes a magnetic field generation device in accordance with the present invention. The water purifier includes a generally cylindrical housing 10, having a longitudinal axis a, an outer wall 31, an inner wall 32 and a bottom 33 which define a chamber 34 therein. A first magnetic layer 101, a second ceramic layer 102, a third magnetic layer 103, a fourth ceramic layer 104, a fifth magnetic layer 105, a sixth ceramic layer 106 and seventh magnetic layer 107 are positioned within the chamber 34.

[0019] In the preferred embodiment of the invention, each magnetic layer 101, 103, 105 or 107 includes an annular magnet 40-1, 40-2, 40-3 and/or 40-4 and broken pieces of magnetite 50-1, 50-2, 50-3 and/or 50-4 respectively. The annular magnets are arranged in such a way that the same polarity of the adjacent annular magnets are facing each other. As illustrated in FIG.1, the S pole of annular magnet 40-1 is facing the S pole of annular magnet 40-2, the N pole of annular magnet 40-2 is facing the N pole of annular magnet 40-3, and the S pole of annular magnet 40-3 is facing the S pole of annular magnet 40-4.

[0020] Each ceramic layer 102, 104 and/or 106 preferably includes granular ceramic particles 60-1, 60-2 and 60-3 respectively. However, in the alternative, the ceramic layers may be formed in a non-granular block form with pores or passages for the passage of water therethrough and/or may be formed of a non-ceramic, non-magnetic material without departing from the invention.

[0021] Water flows from top 30 through layers 101, 102, 103, 104, 105, 106 and 107, then exits through bottom 33. Vice versa, water can also flow in the reverse direction from the bottom 33 through layers 107, 106, 105, 104, 103, 102 and 101, and then exit through top 30.

[0022] Two pairs of magnetic layers are shown in FIG.1. However, the arrangement is not limited to two pairs of magnetic layers and can be any number of magnetic layers as desired. Likewise, the number of ceramic layers can also be varied.

[0023] FIG. 2 is a vertical cross-sectional view of a prior art water purifier which also includes a magnetic field generation device. The purifier includes a housing 20, a first magnetic layer 201, a second ceramic layer 202, a third magnetic layer 203, a fourth ceramic layer 204, a fifth magnetic layer 205, a sixth ceramic layer 206 and a seventh magnetic layer 207. The housing 20 includes an outer wall 34 and a bottom 36.

[0024] Each magnetic layer 201, 203, 205 or 207 includes an annular magnet 40-5, 40-6, 40-7 and/or 40-8 and broken pieces of magnetite 50-5, 50-6, 50-7 and/or 50-8 respectively. As in FIG. 1, the annular magnets are arranged in such a way that the same

polarity of the adjacent annular magnets are facing each other. As illustrated in FIG.2, the S pole of annular magnet 40-5 is facing the S pole of annular magnet 40-6, the N pole of annular magnet 40-6 is facing the N pole of annular magnet 40-7, and the S pole of annular magnet 40-7 is facing the S pole of annular magnet 40-8.

[0025] Each ceramic layer 202, 204 and/or 206 includes granular ceramic particles 60-4, 60-5 and/or 60-6 respectively.

[0026] Water flows from the top 35 of the housing through layers 201, 202, 203, 204, 205, 206 and 207, and then exits through bottom 36. Vice versa, water can also flow in the reverse direction from bottom 36 through layers 207, 206, 205, 204, 203, 202 and 201, and then exits through top 35.

[0027] The annular magnets 40-1, 40-2, 40-3, 40-4, 40-5, 40-6, 40-7 and 40-8 are the same in FIGS. 1 and 2. The amount of magnetite particles 50-1, 50-2, 50-3, 50-4, 50-5, 50-6, 50-7 and 50-8 are also the same. However, the cross-sectional area of chamber 10 is half of that of housing 20.

[0028] For the same water flow passing through chamber 10 and housing 20, the speed of the water flow passing through chamber 10 is double the speed of water flow passing through housing 20. Due to each magnetic layer 10-1,10-3, 10-5, 10-7, 20-1, 20-3, 20-5 and 20-7 having the same annular magnet and same amount of magnetite particles 50-1, 50-2, 50-3, 50-4, 50-5, 50-6, 50-7 and 50-8, and the cross-section of chamber 10 being half the cross-section of housing 20, the density of the magnetic field of magnetic layers is double the density of the magnetic field of magnetic layers 201, 203, 205 and 207.

[0029] Although the magnetic layers 101, 103, 105 and 107 of the chamber 10 are otherwise exactly the same as the magnetic layers of 201, 203, 205 and 207 of housing 20, the effectiveness of the magnetization treatment of the invention as shown in FIG.1 to activate water molecules is four times better that of the prior art as shown in FIG.2

[0030] The water purifier of the invention is shown incorporated in a preferred shower filter as seen in FIG. 3. In FIG. 3 water flows through an inlet 12, tube 13, chamber 14, sediment filter 15, chamber 16, housing 17 and exits through outlet 18 as shown by the arrows. The chamber 16 with outer wall 28 of for example a diameter of 2.2 inches (3.8 sq. in.) and inner wall 21 of for example a diameter 1.7 inches(2.27 sq. in.) the chamber 16 will have a cross-section of 1.53 square inches (3.8 sq. in - 2.27 sq. in). The housing 17 with outer wall 28 of also for example a diameter of 2.2 inches will result in a cross-section of the housing 17 of 3.8 square inches. If the same magnetic field layer is put in chamber 16 instead of housing 17, the effectiveness of the magnetization treatment in chamber 16 is 6.17 times (3.8 x 3.8 / 1.53 / 1.53) better than that in housing 17.

[0031] It will be appreciated that although the water purifier has been shown in FIG. 3 as a shower filter, that the purifier may constitute or be part of any one of a variety of water treatment filters or assemblies other than shower filters.

[0032] Although pieces or particles of magnetite are shown and described as forming the magnetic layers together with the annular magnets, the magnetite may be eliminated and just the

annular magnets relied upon to provide the magnetism in the magnetic layers without departing from the present invention.

[0033] It will also be understood that the preferred embodiments of the present invention as have been described are merely illustrative of the principles of the present invention. Numerous modifications may be made by those skilled in the art without departing from the true spirit and scope of the invention.

What is claimed is:

1. A water purifier comprising:

a housing having an inner wall, an outer wall of greater transverse dimension than said inner wall, and a bottom which define a chamber therebetween in the housing;

the housing having a central longitudinal axis and a pair of opposite ends spaced along said axis, said housing being formed with a water inlet at said one end and a water outlet at said other end to allow a flow of water through said chamber in a direction parallel to said axis;

at least one non-magnetic layer disposed in said chamber, said layer extending perpendicularly across said chamber relative to said axis; and

at least one magnetic layer disposed in said chamber, said magnetic layer comprising an annular magnet, said magnetic layer extending perpendicularly across said chamber relative to said axis.

2. The water purifier of claim 1, wherein said non-magnetic layer comprises ceramic.

3. The water purifier of claim 2, wherein said ceramic comprises granular ceramic particles.

4. The water purifier of claim 1, wherein said non-magnetic layer comprises granular particles.

5. The water purifier of claim 1, wherein said magnetic layer includes magnetite particles therein.

6. The water purifier of claim 5, wherein said non-magnetic layer comprises granular ceramic particles.

7. The water purifier of claim 1, including a filter adjacent said inlet.

8. The water purifier of claim 7, wherein said magnetic layer is disposed between said filter and said ceramic layer.

9. The water purifier of claim 5, comprising at least a pair of magnetic layers disposed in said chamber, one of said magnetic layers being disposed between said water inlet and said ceramic layer and the other said magnetic layer being disposed between said ceramic layer and said water outlet.

10. The water purifier of claim 9, wherein the respective annular magnets of said magnetic layers generate magnetic lines of force which are parallel to said central longitudinal axis and the direction of said flow of the water.

11. The water purifier of claim 10, wherein the respective annular magnets of adjacent magnetic layers are positioned such that the same polarities of the adjacent annular magnets are facing each other and said magnetic lines of force pass through said magnetic layers and thereby magnetize said magnetite particles.

12. The water purifier of claim 9, wherein the respective annular magnets of adjacent magnetic layers are positioned such that the same polarities of the adjacent annular magnets are facing each other.

13. The water purifier of claim 1, including a filter adjacent said inlet.

14. The water purifier of claim 13, wherein said magnetic layer is disposed between said filter and said non-magnetic layer.

15. The water purifier of claim 1, comprising at least a pair of magnetic layers disposed in said chamber, one of said magnetic layers being disposed between said water inlet and said non-magnetic layer and the other said magnetic layer being disposed between said non-magnetic layer and said water outlet.

16. The water purifier of claim 15, wherein the respective annular magnets of said magnetic layers generate magnetic lines of force which are parallel to said central longitudinal axis and the direction of said flow of the water.

17. The water purifier of claim 16, wherein the respective annular magnets of adjacent magnetic layers are positioned such that the same polarities of the adjacent annular magnets are facing each other and said magnetic lines of force pass through said magnetic layers.

18. The water purifier of claim 15, wherein the respective annular magnets of adjacent magnetic layers are positioned such that the same polarities of the adjacent annular magnets are facing each other.

19. The water purifier of claim 1, wherein the water purifier is a shower filter.

20. The water purifier of claim 5, wherein the water purifier is a shower filter.

21. The water purifier of claim 9, wherein the water purifier is a shower filter.

22. The water purifier of claim 11, wherein the water purifier is a shower filter.

23. A water purifier comprising:

a housing having an inner wall, an outer wall of greater transverse dimension than said inner wall, and a bottom which define a chamber therebetween in the housing.

the housing having a central longitudinal axis and a pair of opposite ends spaced along said axis, said housing being formed with a water inlet at said one end and a water outlet at said other end to allow a flow of water through said chamber in a direction parallel to said axis;

a filter disposed adjacent said inlet;

at least one ceramic layer disposed in said chamber between said filter and said outlet, said ceramic layer comprising granular ceramic particles and extending perpendicularly across said chamber relative to said axis;

at least one pair of magnetic layers disposed in said chamber, each said magnetic layer comprising an annular magnet and magnetite particles extending perpendicularly across said chamber relative to said axis, one of said magnetic layers being disposed between said filter and said ceramic layer, and the other of said magnetic layers being disposed between said ceramic layer and said outlet; and

at least a pair of said annular magnets disposed in said chamber and coaxially surrounding said axis, wherein one of said magnets is located between said ceramic layer and said inlet and the other of said magnets is located between said ceramic layer and said outlet such that said annular magnets generate magnetic lines of force which are parallel to said central longitudinal axis and in the direction of said flow of water, said annular magnets being located in such a manner that the same polarities of adjacent ones of said annular magnets are facing each other, and said magnetic lines of force pass through said magnetic layers and thereby magnetize said magnetite particles in said magnetic layers.

24. The water purifier of claim 23, wherein the water purifier is a shower filter.

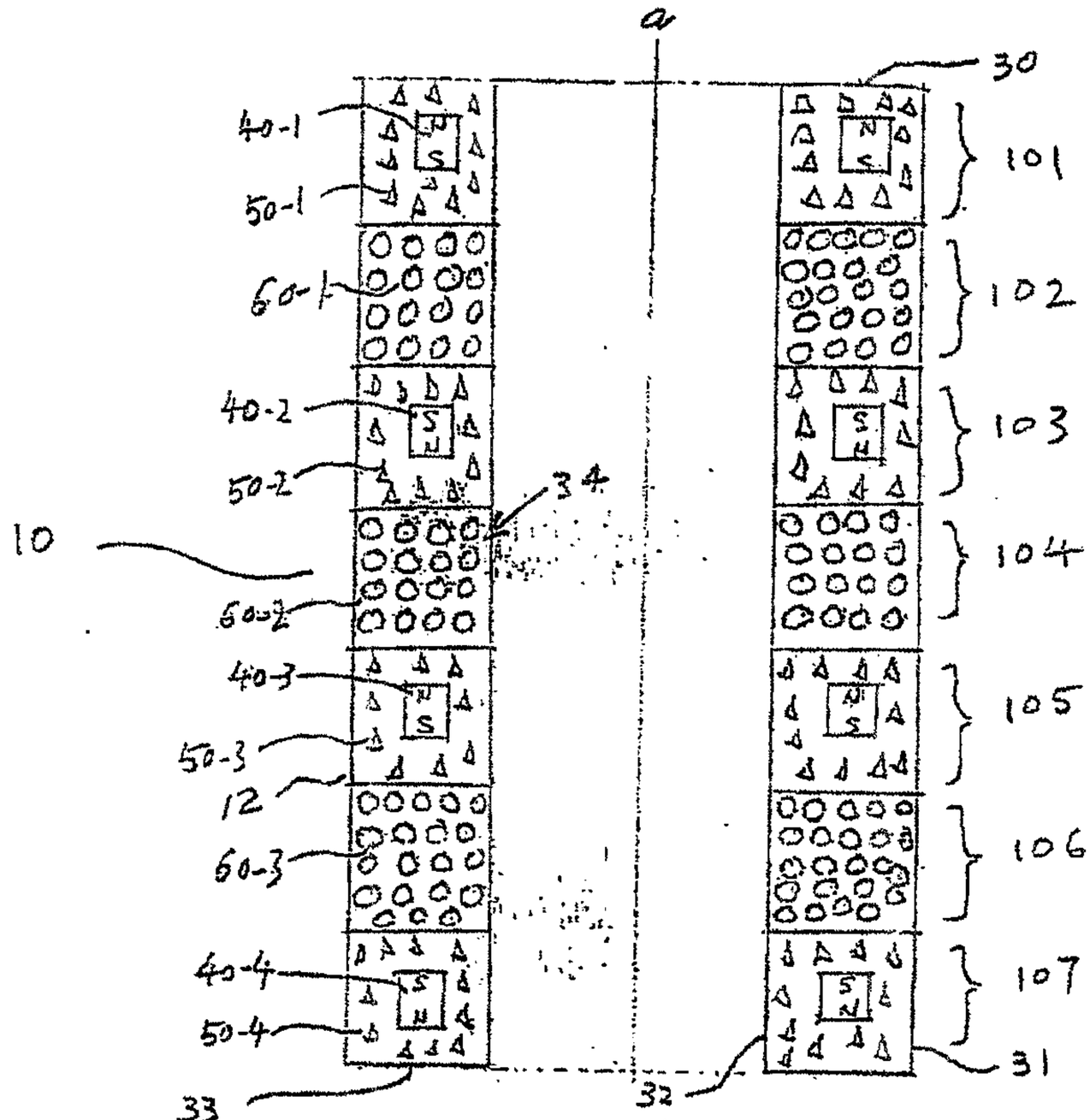


FIG 1

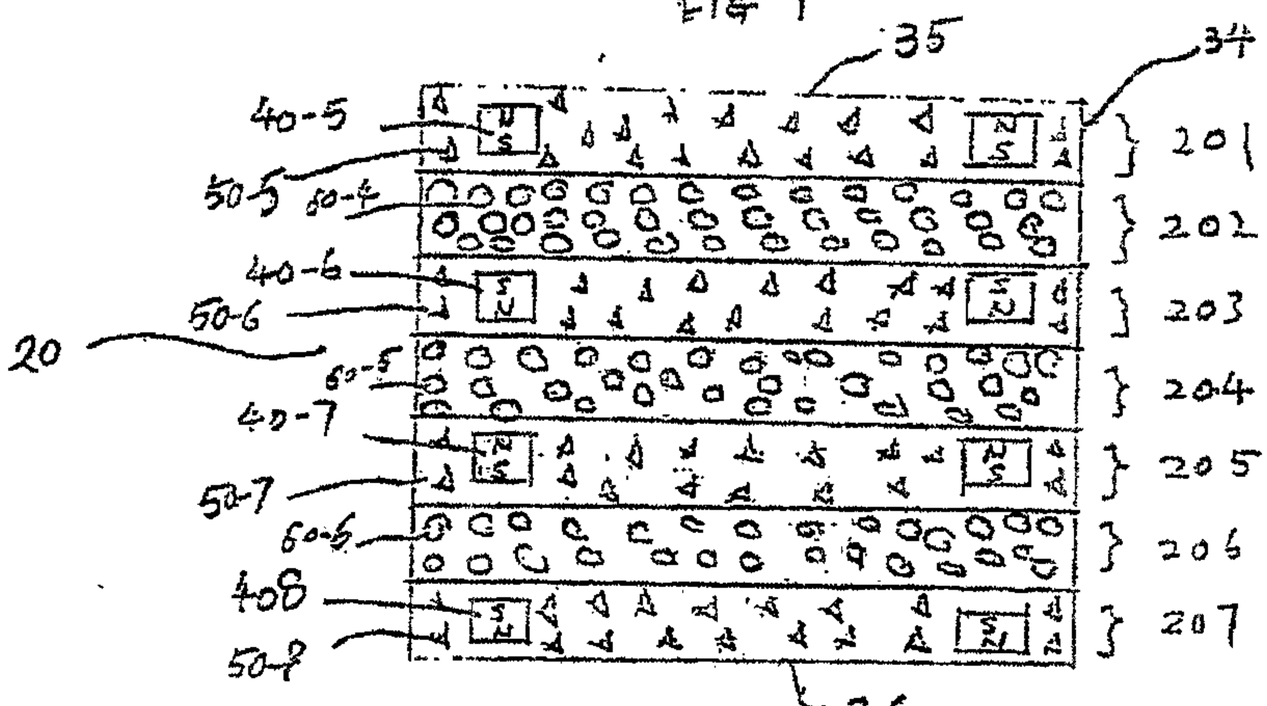


FIG 2

PRIOR ART

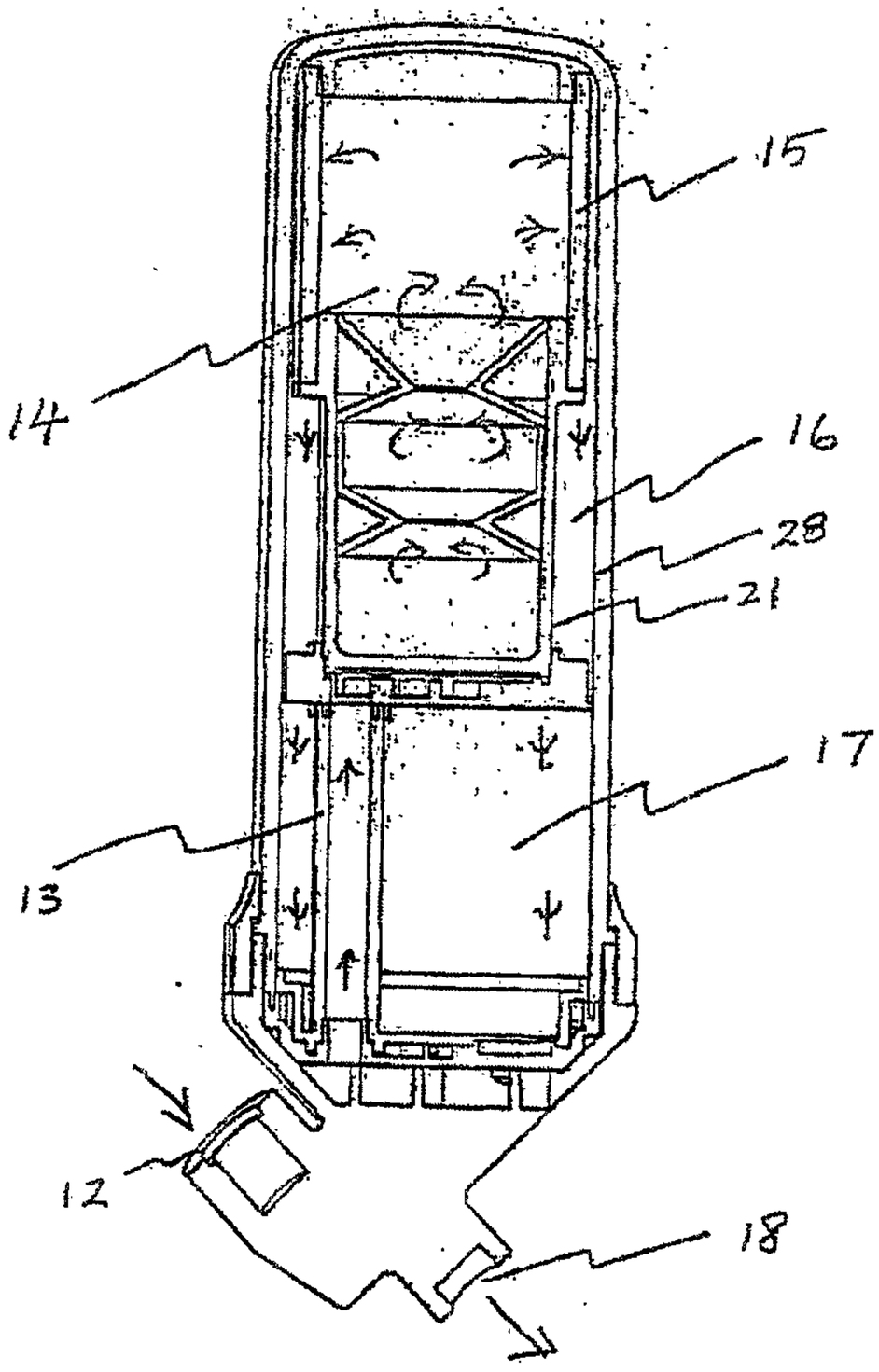
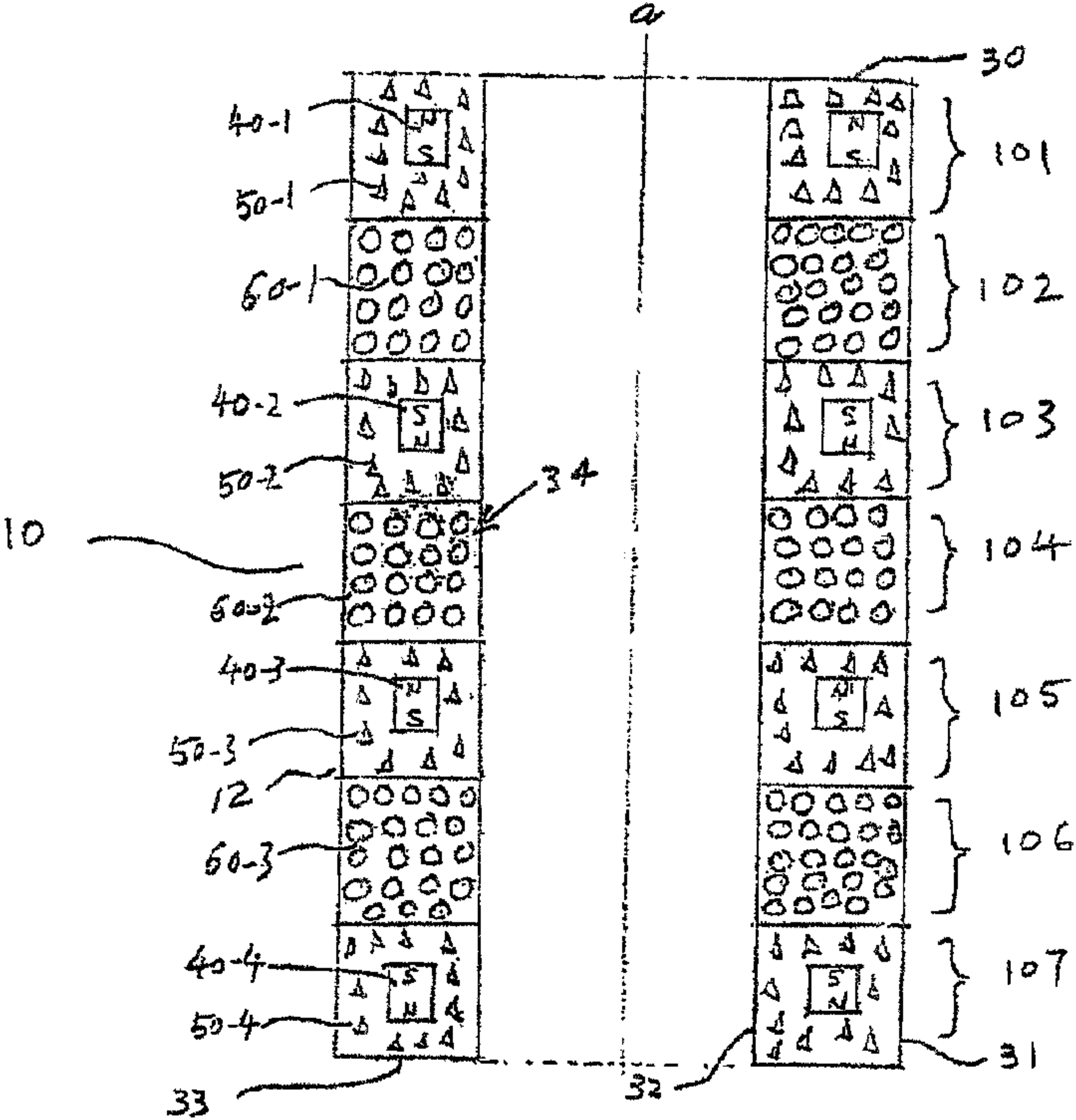


FIG. 3


40-1
50-1
60-1
40-2
50-2
10
60-2
40-3
50-3
12
60-3
40-4
50-4
33
34
32
30
101
102
103
104
105
106
107
31