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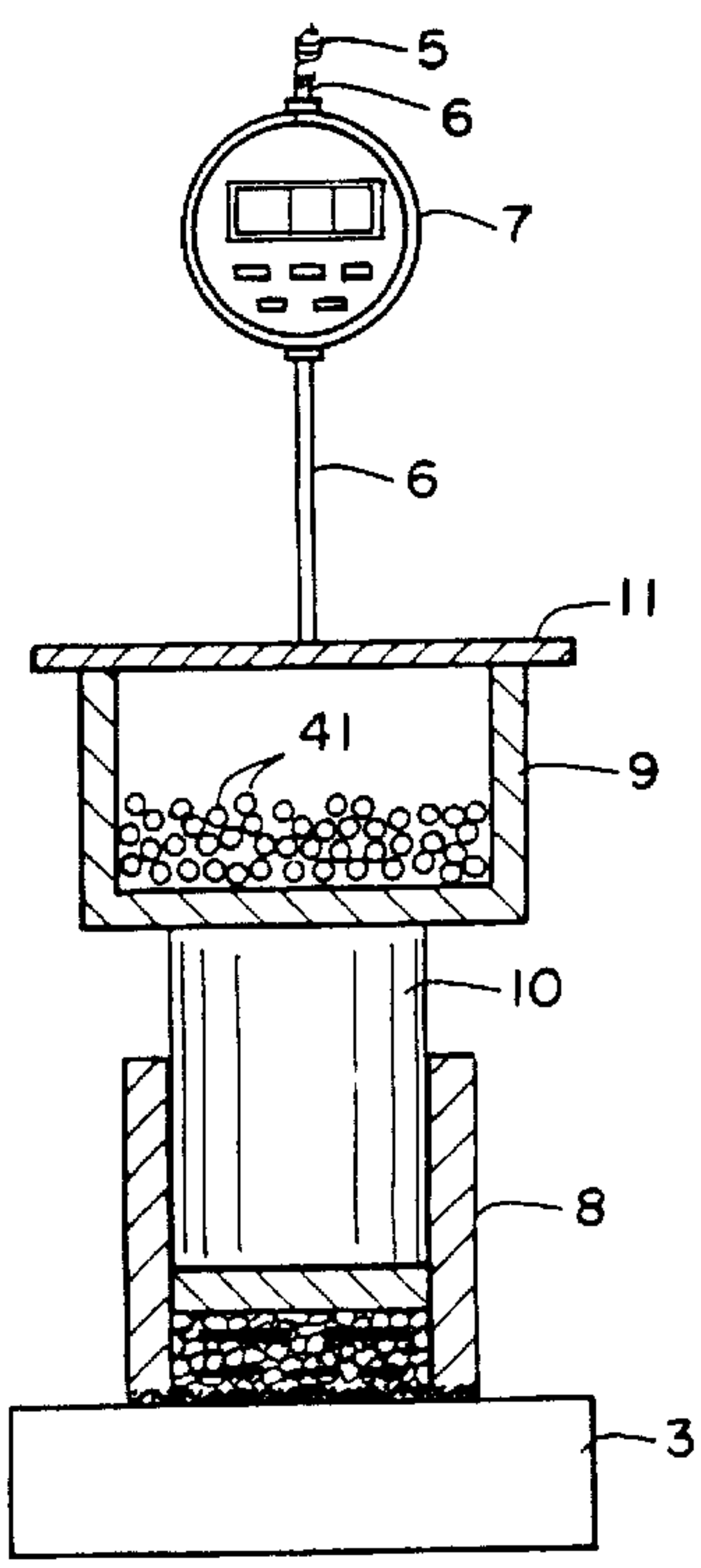

(57) Abrégé/Abstract:
Reducing leakage in disposable diapers having a relatively high loading of superabsorbent materials requires a proper balancing of three properties of the superabsorbent material: the total absorbent capacity, the resistance to deformation when partially saturated, and the ability to wick fluids away from the insult area. Absorbent articles with superabsorbent material/fluff composites, which contain high loadings of superabsorbent material having the proper balance of properties, can be made to be substantially thinner while providing leakage performance equivalent to bulkier conventional articles containing greater amounts of fluff,

ABSTRACT

Reducing leakage in disposable diapers having a relatively high loading of superabsorbent materials requires a proper balancing of three properties of the superabsorbent material: the total absorbent capacity, the resistance to deformation when partially saturated, and the ability to wick fluids away from the insult area. Absorbent articles with superabsorbent material/fluff composites, which contain high loadings of superabsorbent material having the proper balance of properties, can be made to be substantially thinner while providing leakage performance equivalent to bulkier conventional articles containing greater amounts of fluff.

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PATENT

ABSORBENT COMPOSITES AND ABSORBENT ARTICLES CONTAINING SAME

Background of the Invention

In the manufacture of disposable diapers, there is continual effort to improve the performance characteristics of the diaper. Although the structure of a diaper has many components, in many instances the in-use performance of the diaper is directly linked to the characteristics of the absorbent material contained within the diaper. Accordingly, diaper manufacturers strive to find ways of improving in-use absorbency in order to reduce the tendency of the diaper to leak.

One means of achieving this objective has been the extensive use of superabsorbent materials. Recent trends in commercial diaper design have been toward using more superabsorbent and less fiber in order to make the diaper thinner. Similarly in the literature, for example, U.S. Patent No. 5,021,050 to Iskra discloses a compressed composite structure of fibers and at least about 400 weight percent superabsorbent material, based on the weight of the fibers. However, notwithstanding the increase in total absorbent capacity contributed by the addition of larger amounts of superabsorbent material, such diapers often suffer from excessive leaking during use. Hence total absorbent capacity is only one factor to consider when selecting a superabsorbent material and designing a diaper or other absorbent article which will perform with fewer leaks during use.

Therefore there is a need for a superabsorbent material that when used in a highly loaded absorbent composite, does not cause an unacceptable amount of leaking.

Summary of the Invention

It has now been discovered that for diapers having a high loading of superabsorbent material (about 30 weight percent or greater as hereinafter defined), the superabsorbent material must have certain properties not previously appreciated and not necessary for superabsorbent materials used in conventional diapers, which contain less than about 20 weight percent superabsorbent material based on the combined weight of the fluff and the superabsorbent within the absorbent composite. The superabsorbent material properties to be considered are total absorbent capacity, resistance to deformation under load after the superabsorbent material has been partially saturated, and the ability of the superabsorbent material to wick fluids away from the insult area. While not being bound to any theory, it is believed that the resistance to deformation under load and the wicking ability of the superabsorbent material are critical for the performance of a highly loaded superabsorbent composite because of the greater number of particle-to-particle interactions created by the higher concentration of superabsorbent particles within the absorbent composite. Highly deformed superabsorbent particles will tend to block wicking channels which initially exist between the particles. Hence resistance to deformation becomes much more important in such highly loaded superabsorbent composites than in conventional absorbent composites. When considering the three properties mentioned above, it is possible to have a relatively low total absorbent capacity and still have adequate performance in use if the resistance to deformation under load and/or the wicking ability is sufficiently high. However, it will be appreciated that many other factors, not a part of this invention, also greatly impact product performance, such as product design, fit, the conditions under which the product is used, etc.

Hence in one aspect, the invention resides in an absorbent composite comprising a matrix of fibers and superabsorbent material having at least about 30 weight percent superabsorbent material based on the combined weight of the fibers of the matrix and the superabsorbent material, said superabsorbent material having a Deformation Under Load of about 0.60 millimeter or less and a Wicking Index of about 10 centimeters or greater. An Absorbent Capacity of about 28 grams per gram or greater is preferred. The methods for determining Absorbent Capacity (sometimes referred to as" AC"), Deformation Under Load (sometimes referred to as "DUL"), and the Wicking Index (sometimes referred to as "WI") will be described in detail hereinafter.

In another aspect, the invention resides in an absorbent article comprising a liquid-permeable facing material, a liquid-impermeable backing material, and an absorbent composite sandwiched between the facing material and the backing material, said absorbent composite comprising a matrix of fibers and superabsorbent material having at least about 30 weight percent superabsorbent material based on the combined weight of the fibers of the matrix and the superabsorbent material, said superabsorbent material having a Deformation Under Load of about 0.60 millimeters or less and a Wicking Index of about 10 centimeters or greater. An Absorbent Capacity of about 28 grams per gram or greater is preferred. The absorbent article can also contain a number of other components well known in the art such as transfer layers, leg elastics, waist elastics, tapes, and the like.

Although this invention is primarily described in connection with disposable diapers, it is also applicable to other products having an absorbent composite, particularly those which are rapidly exposed to large amounts of liquid, such as training pants, incontinence garments, bed pads, and the like.

In all aspects of this invention, the Deformation Under Load is about 0.6 millimeter or less, preferably about 0.5 millimeter or less, and more preferably about 0.4 millimeter or less, and still more preferably about 0.3 millimeter or less. A suitable range is from about 0.3 to about 0.6 millimeter or less. The Wicking Index is about 10 centimeters or greater, preferably about 12 centimeters or greater, more preferably about 15 centimeters or greater, and most preferably about 18 centimeters or greater. A suitable range is from about 12 to about 19 centimeters or greater. The Absorbent Capacity is preferably about 29 grams per gram or greater, more preferably about 32 grams per gram or greater, still more preferably about 36 grams per gram or greater, and most preferably about 40 grams per gram or greater. A suitable range is from about 29 to about 41 grams per gram or greater.

The amount of the superabsorbent material in the absorbent composite is about 30 weight percent or greater, preferably about 40 weight percent or greater, and more preferably about 50 or 60 weight percent or greater. One embodiment of the absorbent composite of this invention, as used in a diaper, contains about 50 weight percent superabsorbent material. Such a diaper is disclosed in commonly assigned copending Canadian patent application Serial No. 2,060,744, filed February 5, 1992 in the names of W.D. Hanson et al. and entitled "Thin Absorbent Article Having Rapid Uptake of Liquid". However, the amount of superabsorbent material can be from about 30, 40, or 50 weight percent to about 60, 70, 80, or 90 weight percent, even 100 weight percent if the superabsorbent material is in the form of fibers or filaments. The distribution of the superabsorbent material within the absorbent composite can be uniform or nonuniform, such as by being layered or otherwise nonuniformly placed within the absorbent composite.

For purposes herein, the term "superabsorbent material" is any material which is capable of absorbing or gelling at least 10 times its weight, preferably 15 times its weight, of body exudate or a suitable aqueous solution such as 0.9 weight percent solution of sodium chloride in distilled water. Such materials include, but are not limited to, hydrogel-forming polymers which are alkali metal salts of: poly(acrylic acid); poly(methacrylic acid); copolymers of acrylic and methacrylic acid with acrylamide, vinyl alcohol, acrylic esters, vinyl pyrrolidone, vinyl sulfonic acids, vinyl acetate, vinyl morpholinone and vinyl ethers; hydrolyzed acrylonitrile grafted starch; acrylic acid grafted starch; maleic anhydride copolymers with ethylene, isobutylene, styrene, and vinyl ethers; polysaccharides such as carboxymethyl starch, carboxymethyl cellulose, methyl cellulose, and hydroxypropyl cellulose; poly(acrylamides); poly(vinyl pyrrolidone); poly(vinyl morpholinone); poly(vinyl pyridine); and copolymers and mixtures of any of the above and the like. The hydrogel-forming polymers are preferably lightly crosslinked to render them substantially water-insoluble. Crosslinking may be achieved by irradiation or by covalent, ionic, van der Waals attractions, or hydrogen bonding interactions, for example. A preferable superabsorbent material is a lightly crosslinked hydrocolloid. The superabsorbent materials can be in any form suitable for use in absorbent structures or composites, including particles, fibers, bicomponent fibers, filaments, flakes, spheres, and the like.

The fibers useful for the absorbent composite of this invention are preferably in the form of an airlaid batt of comminuted wood pulp (fluff), the formation of which is well known in the art of diaper manufacture. Although comminuted wood pulp is preferred, other cellulosic fibers, such as cotton linters, can also be used. Suitable synthetic fibers include, without limitation, fibers of polyethylene, polypropylene, polyesters, copolymers of polyesters and polyamides, bicomponent fibers, and the like. Mixtures of natural and synthetic fibers can also be used. The fibers used to form the matrix of the absorbent composite are generally hydrophilic or rendered hydrophilic through a suitable surface treatment. The preferred wood pulp fluff is produced by fiberizing bleached northern or southern softwood kraft pulp, although hardwood pulps and blends of hardwood and softwood pulps can also be used. By way of illustration, a blend of hardwood and softwood pulps can have a weight ratio of softwood pulp to hardwood pulp of from about 1:3 to about 20:1.

The absorbent composite of this invention comprises a porous matrix of fibers and superabsorbent material dispersed among the interfiber spaces and/or fiber pores. While particulate superabsorbent material is preferred because of its commercial availability, the superabsorbent material can also be in the form of continuous or discontinuous fibers. The formation of the absorbent composite can be accomplished in any number of ways, such as are currently used in the manufacture of commercially available diapers. A suitable example of one means of forming the absorbent composite is disclosed in U.S. Patent No. 4,927,582 to Bryson et al.

Because the superabsorbent material in the absorbent composite is present in relatively high proportions, the absorbent composite of the present invention can be relatively thin while still functioning in an acceptable manner. Advantageously, the absorbent composites of this invention can have an average thickness of less than about 0.2 inch and preferably less than about 0.15 inch. As used herein, the average thickness is the average of a statistically significant number of thickness measurements taken under an applied load of 0.2 pounds per square inch. The number of thickness measurements taken depends on the size and uniformity of the absorbent composite, and must be sufficient to represent the average thickness of the entire absorbent composite.

Brief Description of the Drawing

Figure 1 is a perspective view of the apparatus for measuring the Deformation Under Load.

Figure 2 is a sectional view of the sample cup used for measuring the Deformation Under Load.

Figure 3 is a sectional view of the sample while being partially saturated in preparation for measuring the Deformation Under Load.

Figure 4 is a sectional view of the apparatus illustrated in Figures 1-3 while measuring the Deformation Under Load.

Figure 5 is a perspective view of the apparatus used to determine the Wicking Index.

Figure 6 is a side view of the apparatus of Figure 5.

Detailed Description of the Invention

In order to determine the Deformation Under Load and the Wicking Index for the superabsorbent materials of this invention, as will be hereinafter described, a synthetic urine was used as the absorbed fluid to closely approximate in use performance in diapers. The synthetic urine composition referenced herein comprises 1.0 gram methyl paraben, 0.68 grams monobasic potassium phosphate (KH_2PO_4), 0.31 grams monobasic calcium phosphate monohydrate ($CaH_4(PO_4)_2H_2O$), 0.48 gram magnesium sulphate heptahydrate ($MgSO_4$ $7H_2O$), 1.33 grams potassium sulphate (K_2SO_4), 1.24 grams tribasic sodium phosphate dodecahydrate (Na_3PO_4 $12H_2O$), 4.44 grams sodium chloride (NaCl), 3.16 grams potassium chloride (KCl), 8.56 grams of urea ($CO(NH_2)_2$), 1.0 gram Germall 115 preservative (commercially available from Santell Chemical Company, Chicago, Illinois), and 0.1 gram Pluronic 10R8 surfactant (a nonionic surfactant commercially available from BASF-

Wyandotte Corporation). The components are added to 900 milliliters of distilled water in the order given and each dissolved before the next component is added. The solution is finally diluted to 1 liter and has a surface tension in the range of 54-58 dynes per centimeter.

Referring now to the Drawing, the invention will be further described in more detail. As previously discussed, the Deformation Under Load is an important factor in the various aspects of this invention. The Deformation Under Load is essentially a measure of a gelled superabsorbent material's ability to resist compression deformation under a controlled load. Briefly, the test involves the incomplete saturation of a superabsorbent material with a fixed amount of synthetic urine, compressing the superabsorbent material under a light load, and then measuring the deformation of the sample under a heavier load, all under ambient conditions. Referring to Figures 1-4, the test apparatus and procedure will be described in detail.

Figure 1 is a perspective view of the test apparatus during testing. Shown is a laboratory jack 1 having an adjustable knob 2 for raising and lowering the platform 3. A laboratory stand 4 supports a suspension spring 5 connected to the probe 6 of a modified thickness meter (described below). The housing 7 of the thickness meter is rigidly affixed to and supported by the laboratory stand. The probe extends through the housing of the thickness meter, which detects any movement of the probe. Also shown is a plastic sample cup 8, a plastic weight cup 9 having a cylindrical foot 10, and a glass slide 11.

The modified thickness meter, which is used to measure the deformation of the sample under load, is a Mitutoyo Digimatic Indicator, IDC Series 543, Model 543-180, having a range of 0-0.5 inch and an accuracy of 0.00005 inch (Mitutoyo Corporation, 31-19, Shiba 5-chome, Minato-ku, Tokyo 108, Japan). As supplied from Mitutoyo Corporation, the thickness meter contains a spring attached to the probe within the meter housing. This spring is removed to provide a free falling probe, which has a downward force of about 27 grams. In addition, the cap over the top of the probe located on the top of the meter housing is also removed to enable attachment of the probe to the suspension spring 5 (Available from McMaster-Carr Supply Co., Chicago, Illinois, Item No. 9640K41), which serves to counter or reduce the downward force of the probe to about 1 gram, ± 0.5 gram. A wire hook can be glued to the top of the probe for attachment to the suspension spring. The bottom tip of the probe is also provided with an extension needle (Mitutoyo Corporation, Part No. 131279) to enable the probe to be inserted into the sample cup.

Figure 2 is a sectional view of the sample cup 8 into which the superabsorbent particles 21 to be tested are placed. The sample cup is a plastic cylinder having a 1 inch inside diameter and an outside diameter of 1.25 inch. The bottom of the cup is formed by adhering (gluing) a 100 mesh metal screen 22, having 150 micron openings, to the end of the cylinder. A 0.1600 gram (±.0005 gram) sample of the superabsorbent material, which has been sieved to a particle size between 300 and 600 microns, is placed into the sample cup and evenly spread over the screen bottom. (Fibrous superabsorbent materials need not be sieved.) The sample is then covered with a plastic spacer disc 23 (having a diameter of 0.990-0.995 inch) to protect the sample from being disturbed during the test.

The sample cup is then slowly lowered into a plastic reservoir cup 31 containing 4.00 grams of synthetic urine 32 as illustrated in the sectional view of Figure 3, being careful not to disrupt the superabsorbent material with escaping air. The inside diameter of the reservoir cup is only slightly greater than 1.25 inch in order to provide a snug fit between the sample cup and the reservoir cup sufficient to prevent the synthetic urine from escaping between the sample cup and the reservoir cup. The sample cup is lowered to the bottom of the reservoir cup such that the synthetic urine is gently forced up through the screen to evenly contact the superabsorbent material. The sample cup remains inside the reservoir cup for 30 minutes to ensure that all of the synthetic urine is absorbed by the sample.

The sample cup is removed from the reservoir cup and placed on the platform 3 of the laboratory jack as illustrated in the sectional view of Figure 4. The plastic weight cup 9 having a cylindrical foot

10 is used to apply a known load to the sample. The cylindrical foot has an outside diameter of 0.990-0.995 inch. The bottom of the foot is solid. The weight cup is also provided with a glass slide 11 which bridges the open top of the weight cup and provides a flat surface against which the probe 6 of the thickness meter is positioned. The combined total weight of the weight cup, including the foot and the glass slide, and the spacer disc in the sample cup, is 100 grams. If the total weight falls short of 100 grams, some lead shot can be placed inside the weight cup to bring the combined weight up to the 100 gram level.

When testing the sample, the foot of the weight cup is placed inside the sample cup and the platform is raised up until the probe of the thickness meter contacts the glass slide and then is raised up slightly further to give the probe enough play to return toward its initial position during the subsequent test. For most materials, the probe should be raised about 3 millimeters above its normal resting point. The load on the sample at this point is 0.3 pounds per square inch. The thickness meter is then set to zero, and 200 grams of lead shot 41 or other suitable weight are added to the weight cup, bringing the load up to 300 grams or 0.9 pounds per square inch. The downward distance of travel of the probe from the zero point, which is read after the rate of change is less than 0.006 millimeters in two minutes, expressed in millimeters, is the Deformation Under Load of the sample. Normally the reading can be taken within 10 to 20 minutes.

The Wicking Index is a measure of a superabsorbent material's ability to wick away fluid without the aid of a fibrous network. This property can be especially important for absorbent composites containing high loadings of superabsorbent material and relatively low amounts of fluff. Briefly, the test is performed at ambient conditions by spreading out an amount of superabsorbent material into a continuous bed of particles within an inclined trough and contacting the bottom of the continuous bed of superabsorbent particles with synthetic urine and measuring the distance the synthetic urine has been wicked after 60 minutes. Referring to

Figures 5 and 6, the apparatus and method for determining the Wicking Index will be further described.

Figure 5 is a perspective view of the apparatus for carrying out the Wicking Index measurement. Shown is a trough sheet 51 made of rigid metal (18 gauge 304 stainless steel having an extra low carbon surface and a grade 2B finish) and containing six trough channels 52. Each trough channel has 90° side angles and must be at least 20 centimeters in length. The peak-to-peak width of each trough channel is 5.5 centimeters. The depth of each trough is 4 centimeters. The trough sheet is enclosed on one end with a 100 mesh stainless steel screen 53 (having 150 micron openings) which has been soldered to the trough sheet and serves to contain the superabsorbent material being tested while permitting the synthetic urine to pass through. The trough length is incremented in 0.5 centimeter units beginning with 0 centimeters at the enclosed screen end. A cross bar 54 attached to the trough sheet provide means for supporting the trough sheet using laboratory stands 55 with suitable clamps or other attachment means. A fluid reservoir pan 56, having 3 inch high sidewalls and a length of about 12 inches and a width of about 18 inches, is sufficiently large to enclose the screen end of the trough sheet and contains a sufficient amount of synthetic urine 57 to carry out the test as described below. Two laboratory jacks 58 provide a means for raising or lowering the reservoir pan under the trough sheet for fluid level adjustment. Also shown are six individual particle beds 59 of superabsorbent material evenly spread out a length of 20 centimeters within the trough channels.

Figure 6 is a side view of the apparatus of Figure 5 in position during testing. Shown is the trough sheet 51 supported by the laboratory stands at an angle of 20° from horizontal as indicated by the double arrow. The laboratory jacks 58 support the reservoir pan 56 in position to enable the superabsorbent samples within the individual trough channels to wick the fluid from the reservoir pan.

To carry out the Wicking Index measurement, the trough sheet is supported above the fluid reservoir pan at an angle of 20° from horizontal. The screened end of the trough sheet, which is the lowermost end, is level side to side. Before starting the test, the bottom (screened end) of the trough sheet should be approximately 2-3 inches above the bottom of the reservoir pan, which should be level. Individual samples of superabsorbent material (1.00 gram each, ± 0.005 gram, sieved to 300-600 microns particle size) are evenly sprinkled in separate trough channels between the 0 and 20 centimeter graduations, assuring an even distribution. (For samples which have a Wicking Index greater than 20 centimeters, the bed of particles can be spread over a distance greater than 20 centimeters using a proportionally greater sample size.) Using the squared off end of a 5/16 inch wide spatula, each superabsorbent particle bed is smoothed out and more evenly spread within its trough channel. Synthetic urine, colored with FD&C Blue Dye #1 to enhance measurement readings without altering the surface tension beyond the target range of 54-58 dynes per centimeter, is poured into the reservoir pan making sure that the trough channels do not get wet. A fluid level in the reservoir pan of about 2 centimeters has been found to be adequate for testing six samples simultaneously. The reservoir pan is carefully raised to a level where a visual approximation of simultaneous contact of the fluid with all of the trough channels will occur. Adjustment of the trough sheet to the fluid can be done at this time by either raising or lowering one of the side arm clamps on the laboratory support stands while maintaining the 20° angle. The reservoir pan is further raised until the fluid level is about 0.5 centimeter above the trough bottom to assure a continual availability of fluid to the superabsorbent particle bed. As soon as the fluid wets the stainless steel screen, timing of the test is begun. After 60 minutes, the distance the fluid has been wicked is observed. This is the Wicking Index, expressed as centimeters.

As used herein, the Absorbent Capacity is a measure of the absorbent capacity of the superabsorbent material retained after being subjected to centrifugation under controlled conditions. It is measured by placing 0.200 grams of the sample material to be tested (moisture content of less than 5 weight percent) into a water-permeable bag which will contain the sample while allowing the test solution (0.9 percent NaCl solution) to be freely absorbed by the sample. A heat-sealable tea bag material (grade 542, commercially available from Kimberly-Clark Corporation, Neenah, Wisconsin) works well for most applications. The bag is formed by folding a 5 inches by 3 inches sample of the bag material in half and heat sealing two of the open edges to form a 2.5 x 3 inch rectangular pouch. The heat seals should be about 0.25 inch inside the edge of the material. After the sample is placed in the pouch, the remaining open edge of the pouch is also heat-sealed. Empty bags are also made to be tested with the sample bags as controls. Three sample bags are tested for each superabsorbent material.

The sealed bags are placed between two Teflon® coated fiberglass screens having 1/4 inch openings (Taconic Plastics, Inc., Petersburg, N.Y.) and submerged in a pan of 0.9 percent NaCl solution at 73.4°F. $\pm$ 2°F., making sure that the screens are held down until the bags are completely wetted. After wetting, the samples remain in the solution for 30 minutes, at which time they are removed from the solution and temporarily laid on a nonabsorbent flat surface. The wet bags are then placed into the basket of a suitable centrifuge capable of subjecting the samples to a g-force of 350. (A suitable centrifuge is a Clay Adams Dynac II, model #0103, having a water collection basket, digital rpm gauge, and machined drainage basket adapted to hold and drain the flat bag samples.) The samples must be placed in opposing positions within the centrifuge to balance the basket when spinning. The bags are centrifuged at a target of 1600 rpm, but within the range of 1500-1900 rpm, for 3 minutes (target g-force of 350). The bags are removed and weighed, with the empty bags (controls) being weighed first, followed by the bags containing superabsorbent material. The amount of fluid absorbed and retained by the superabsorbent material, taking into account the fluid retained by the bag material alone, is the Absorbent Capacity of the superabsorbent material, expressed as grams of fluid per gram of superabsorbent material.

Examples

In order to illustrate the advantages of this invention, diapers having absorbent composites containing 10 grams of fluff and

10 grams of superabsorbent material were tested in use to determine their effectiveness in reducing leaks. The structure of the test diapers was as disclosed in the aforementioned commonly assigned copending Canadian patent application Serial No. 2,060,744 but did not include a surge material. More specifically, 60 babies (30 male and 30 female) were recruited. The care giver was given 10 diapers containing a particular superabsorbent sample and instructed to use the diapers for two days under normal conditions and to indicate if the diaper leaked or not. Diapers containing bowel movements were excluded from consideration when evaluating the data. A total of 600 diapers were used for each superabsorbent sample.

The performance evaluation for the various samples is based on the leakage of the test diaper relative to a control diaper in the same use test. Because use tests conducted at different times with different babies will often yield different absolute leakage numbers, relative results within a given use test, as compared to a control, are a more representative indicator of the effectiveness of the superabsorbent being tested. The control diaper for all testing was a commercially available diaper having a superabsorbent material loading of about 12-15 weight percent (HUGGIES™ Supertrim, manufactured by Kimberly-Clark Corporation, Neenah, Wisconsin). A performance rating of "+" means that no significant difference (within 95% confidence limits) in overall leakage was observed relative to the control. A performance rating of "O" means that there was a statistically significant difference in the overall percent leakage relative to the control, but the difference was less than 6 percentage points. A performance rating of "-" means an unacceptable amount of overall leakage relative to the control (greater than 6 percentage points).

The results of diaper leakage testing are presented below in Table 1. As indicated, some superabsorbent samples were use-tested twice. The sample identifications, including the manufacturer, are as follows: Sample 1- Partial sodium salt of crosslinked poly-2-propenoic acid (Dow Chemical Company, Midland, Michigan, No.40453.00, lot 105); Sample 2- Starch grafted crosslinked sodium salt of poly(acrylic acid) (Hoechst Celanese Corporation, Portsmouth, Virginia, No. S-243); Sample 3- Starch grafted crosslinked sodium salt of poly(acrylic acid) (Hoechst Celanese, Sanyo IM5000S); Sample 4- Starch grafted sodium salt of poly(acrylic acid) (Hoechst Celanese S-241); Sample 5- Polyacrylate/polyalcohol (Stockhausen, Inc., Greensboro, North Carolina, No. W45926); Sample 6- Starch grafted crosslinked sodium salt of poly(acrylic acid) (Hoechst Celanese, No. IM3900); Sample 7- Partial sodium salt of crosslinked poly-2-propenoic acid (Dow 40453.00, lot 111-2); Sample 8- Polyacrylate/polyalcohol (Stockhausen, No. W45353); Sample 9- Polyacrylate/polyalcohol (Stockhausen, Favor SAB 835; Sample 10- Partial sodium salt of crosslinked polypropenoic acid (Dow, Drytech 534); Sample 11- Starch grafted crosslinked sodium salt of poly(acrylic acid) (Hoechst Celanese, S-242; Sample 12- Polyacrylate/polyalcohol (Stockhausen, No. W45939); and Sample 13- Starch grafted crosslinked sodium salt of poly(acrylic acid) (Hoechst Celanese IM1000P).

Table 1

Sample	AC	DUL	WI	Performance
1	29	0.40	16.5	+
2	41	0.38	13.0	+
3	35	0.38	18.0	+
4	37	0.43	15.0	+
5	33	0.54	16.5	0
6	34	0.34	18.5	+
7	28	0.40	16.5	0
8	39	0.45	12.5	0
9	30	1.02	15.0	0
	30	1.01	15.0	-
10	31	0.79	13.0	-
	31	0.79	13.0	-
11*	42	0.66	12.5	-
12	32	0.58	16.0	0
13**	51	0.29	5.5	-

* The superabsorbent material was removed from a test diaper before the DUL and WI were measured. This may be necessary if the diaper manufacturing process changes the properties of the superabsorbent material.

** Performance was tested under similar conditions, but different than the conditions used for the other samples.

The results of Table 1 show that the Deformation Under Load and the Wicking Index are the major factors when evaluating performance. Minimal Absorbent Capacity (about 28 grams per gram) can be acceptable if the superabsorbent material exhibits a Deformation Under Load of about 0.60 millimeters or less and a Wicking Index of about 10 centimeters or greater.

It will be appreciated that the foregoing examples, provided for purposes of illustration, are not to be taken as limiting the scope of this invention, which is defined by the following claims and includes all equivalents thereto.

CLAIMS:

1. An absorbent composite comprising a matrix of fibers and superabsorbent material having at least about 30 weight percent superabsorbent material based on the combined wight of the fibers and the superabsorbent material, said superabsorbent material having a Deformation Under Load of about 0.60 millimetres or less and Wicking Index of about 10 centimetres or greater.

2. The absorbent composite of claim 1, having about 40 weight percent or more superabsorbent material.

3. The absorbent composite of claim 1, having about 50 weight percent or more superabsorbent material.

4. The absorbent composite of claim 1, having about 60 weight percent or more superabsorbent material.

5. The absorbent composite of claim 1, having about 70 weight percent or more superabsorbent material.

6. The absorbent composite of claim 1, having about 80 weight percent or more superabsorbent material.

7. The absorbent composite of claim 1, having about 90 weight percent or more superabsorbent material.

8. The absorbent composite of any one of claims 1 to 7, having a Deformation Under Load of about 0.5 millimeter or less.

9. The absorbent composite of claim 8, having a Deformation Under Load of about 0.4 millimeter or less.

10. The absorbent composite of claim 9, having a Deformation Under Load of about 0.3 millimeter or less.

11. The absorbent composite of any one of claims 1 to 7, having a Deformation Under Load of from about 0.3 to about 0.6 millimeter.

12. An absorbent composite comprising a matrix of fibers and superabsorbent material having at least about 50 weight percent superabsorbent material based on the combined weight of the fibers and the superabsorbent material, said superabsorbent material having a Deformation Under Load of about 0.6 millimetres or less and a Wicking Index of about 12 centimetres or greater.

13. The absorbent composite of any one of claims 1 to 12, wherein the Wicking Index is about 15 centimetres or greater.

14. The absorbent composite of claim 13, wherein the Wicking Index is about 18 centimetres or greater.

15. An absorbent composite comprising a matrix of fibers and superabsorbent material having from about 30 to about 60 weight percent superabsorbent material based on the combined weight of the fibers and the superabsorbent material, said superabsorbent material having an Absorbent Capacity of from about 28 to about 41 grams per gram, a Deformation Under Load of from about 0.3 to about 0.6 millimeter, and a Wicking Index of from about 12 to about 19 centimetres.

16. An absorbent article comprising a liquid-permeable facing material, a liquid impermeable backing material, and an absorbent composite as defined in any one of claims 1 to 15 sandwiched between the facing material and the backing material.

17. The absorbent article of claim 16, said article being a disposable diaper.

18. The absorbent article of claim 16, said article being a training pant.

19. The absorbent article of claim 16, said article being an incontinence garment.

20. The absorbent article of claim 16, said article being a bed pad.

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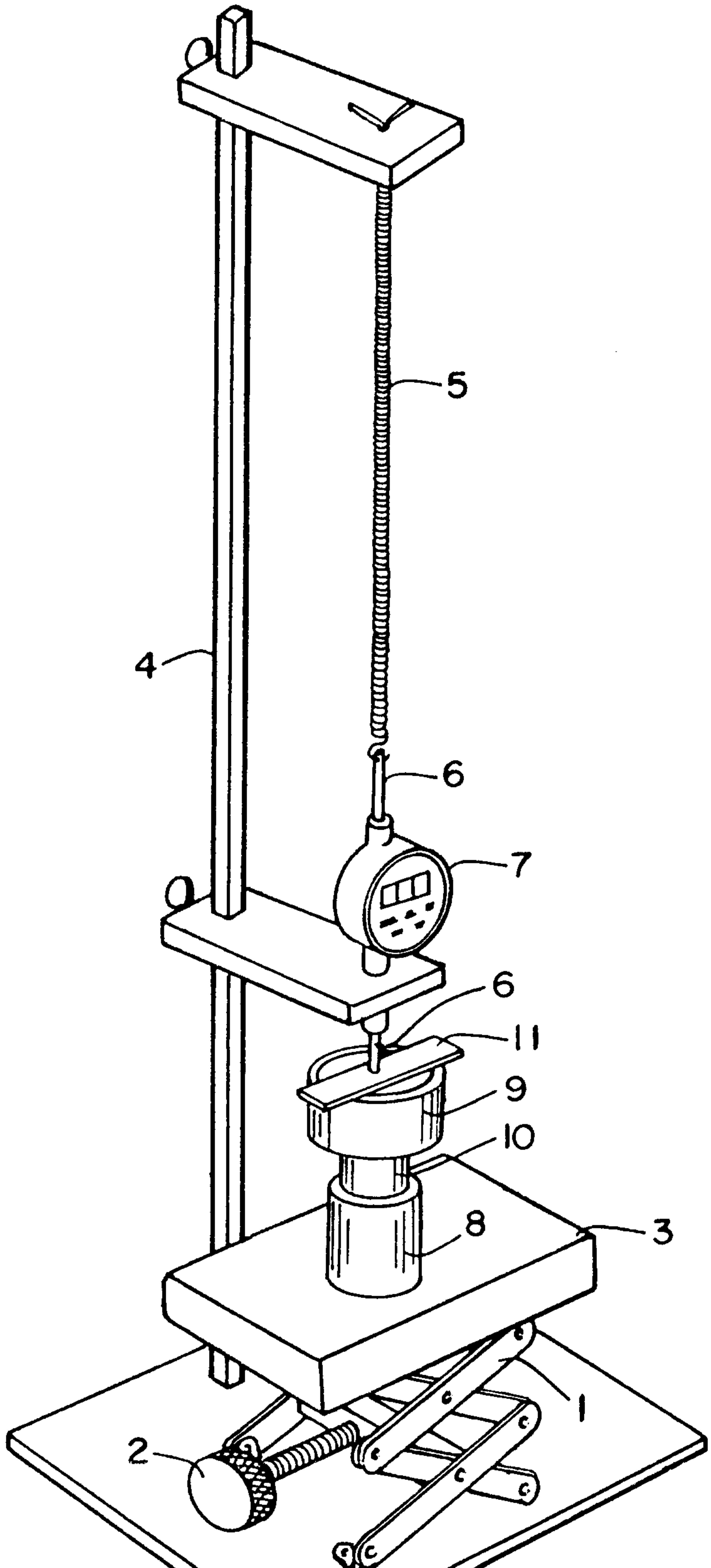

FIG. 1

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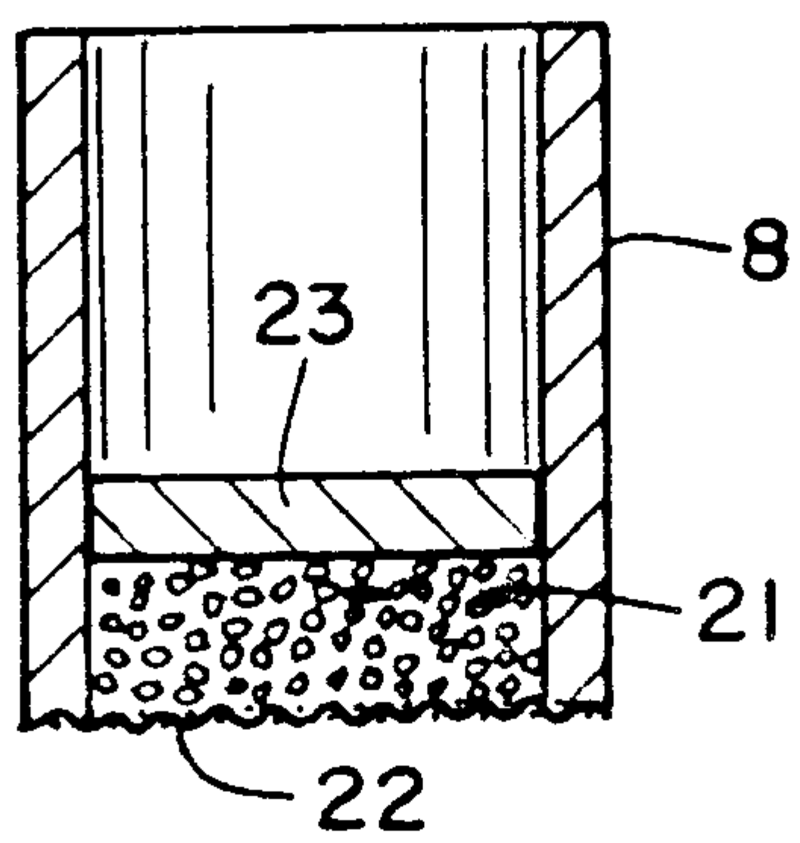

FIG. 2

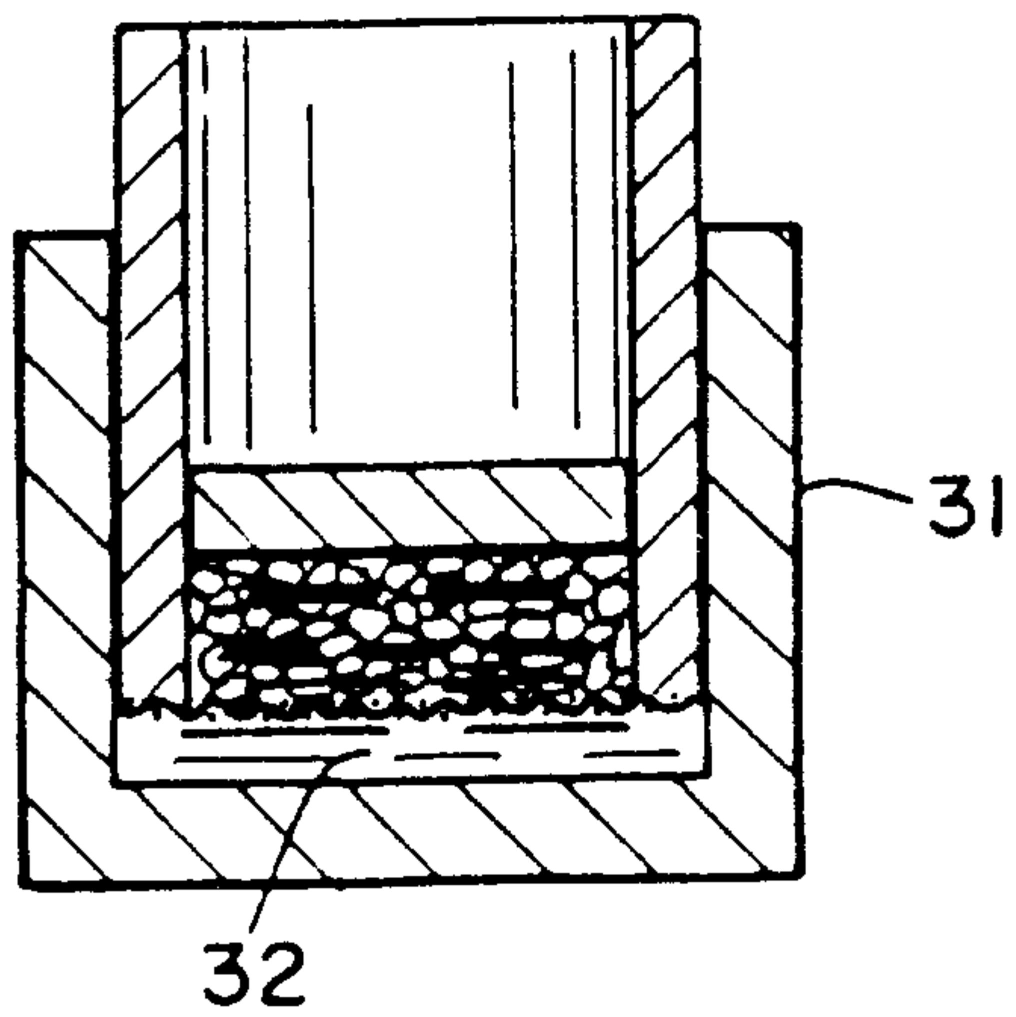

FIG. 3

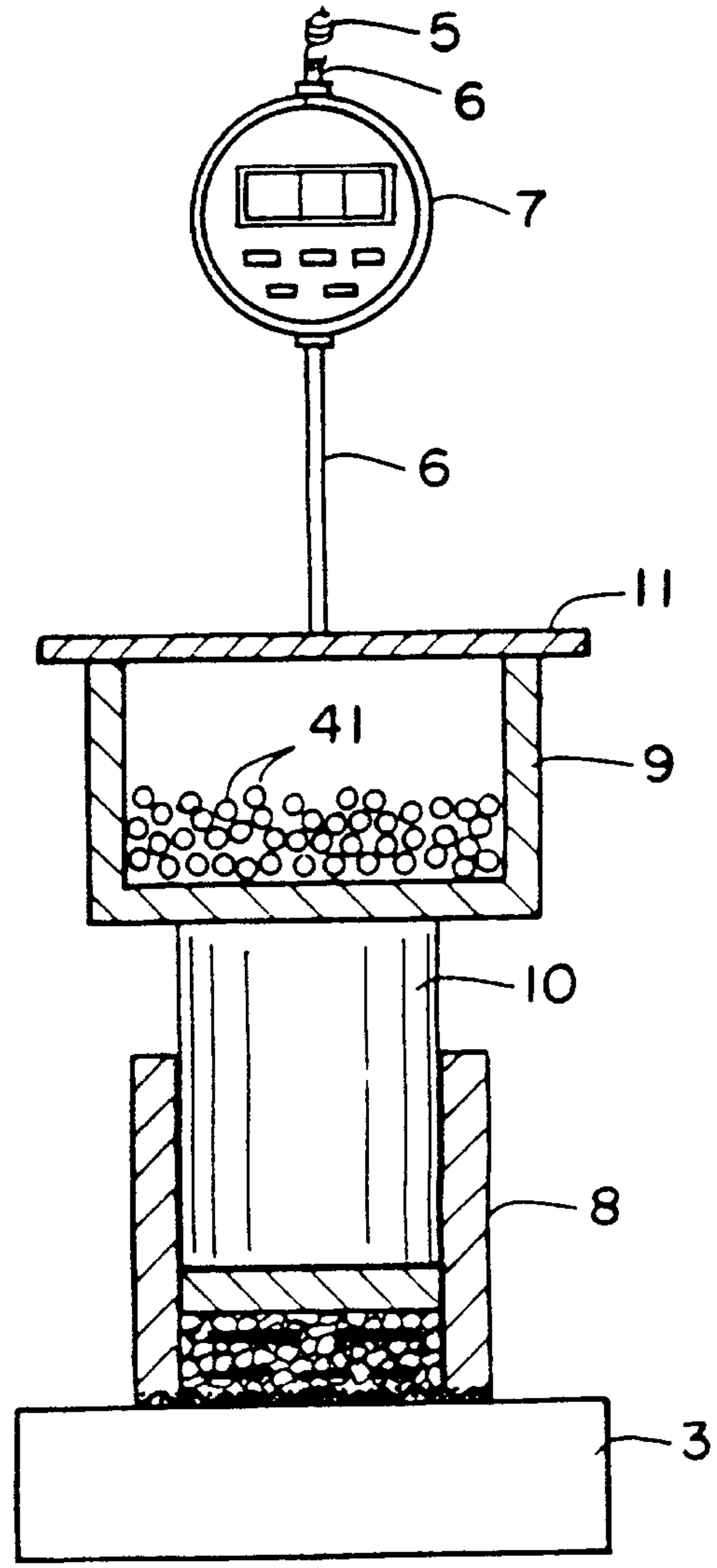

FIG. 4

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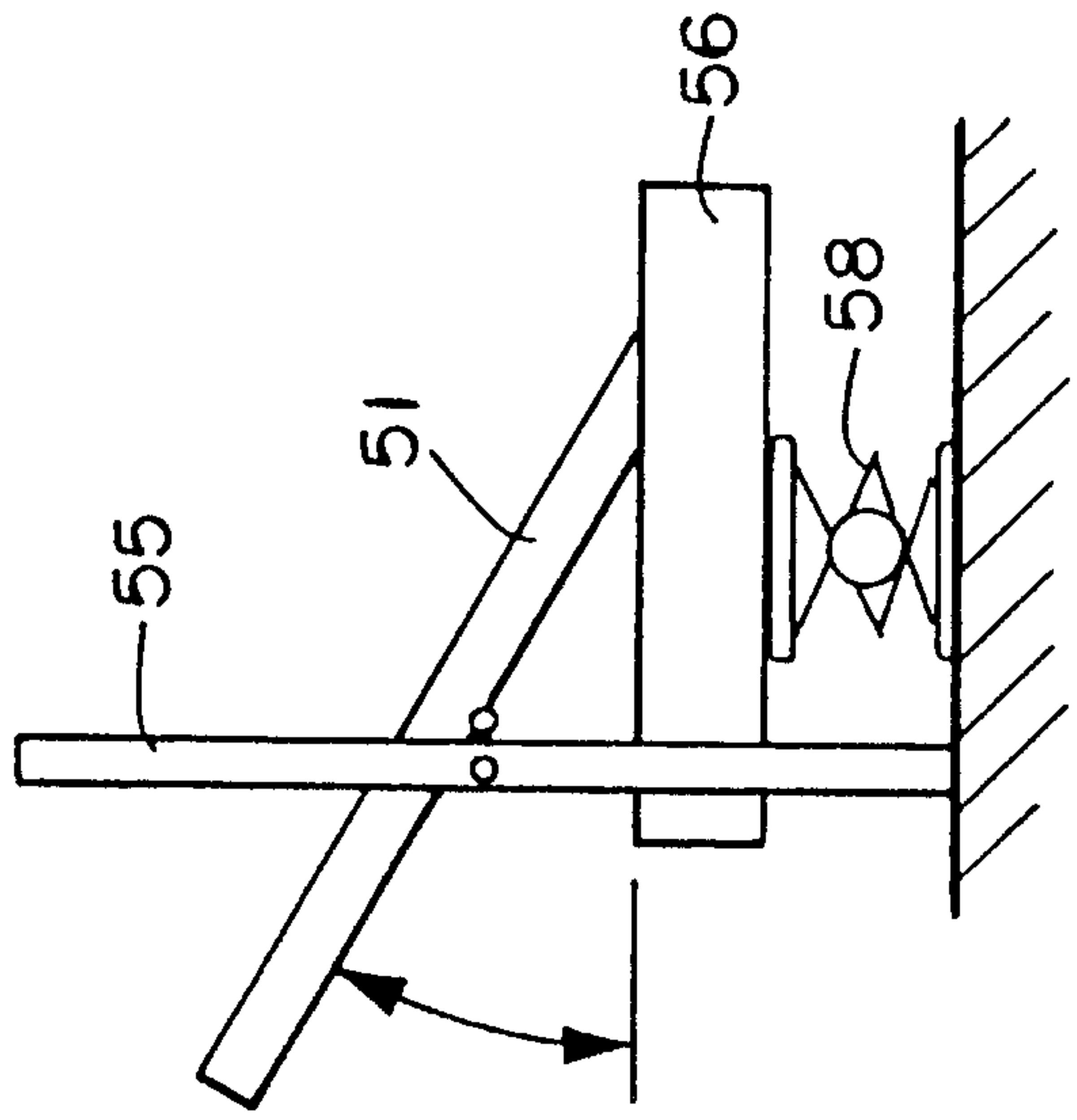

FIG. 6

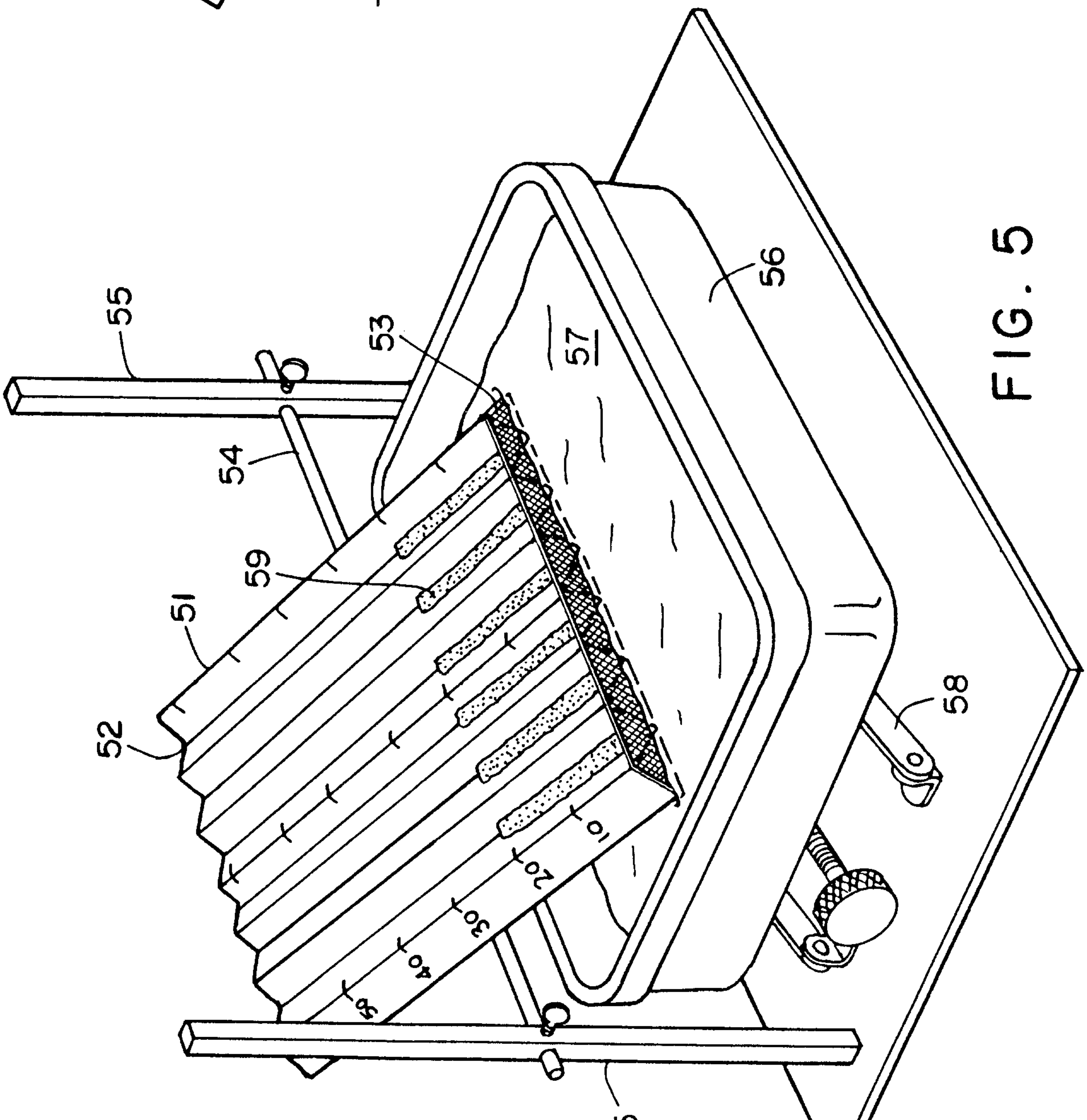

FIG. 5

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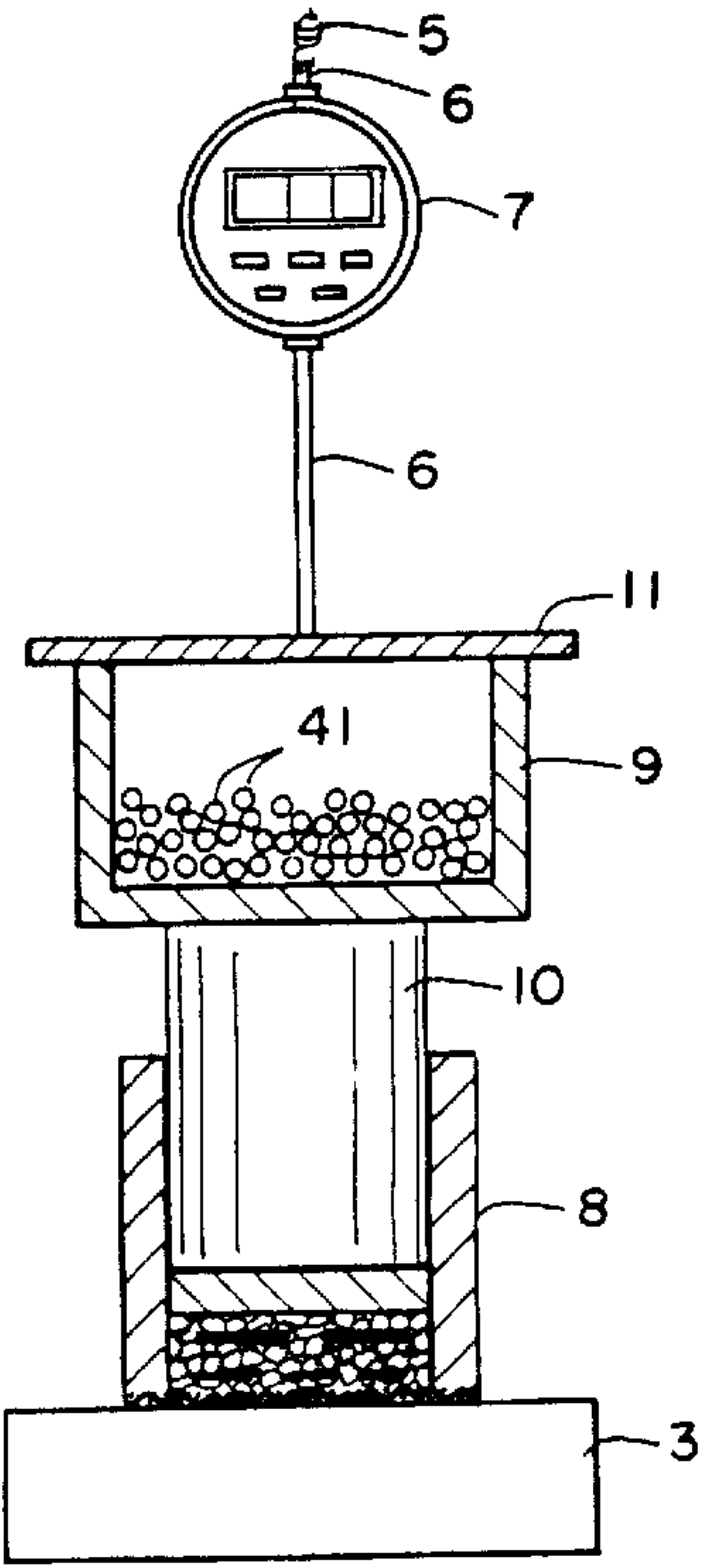

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