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METHOD FOR TESTING REGENERATED CELLULOSE SPONGE

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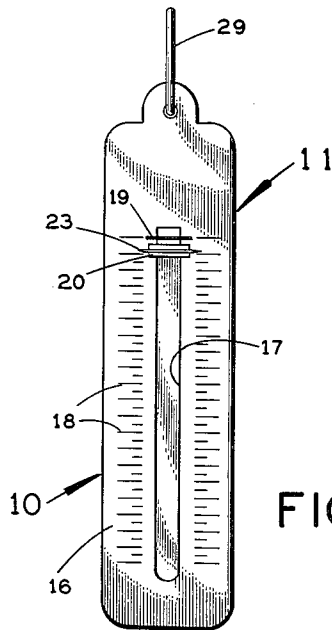


FIG. 1

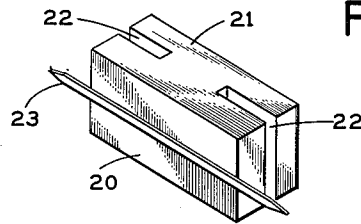


FIG. 2

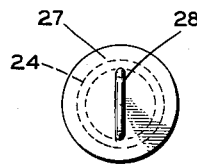


FIG. 3

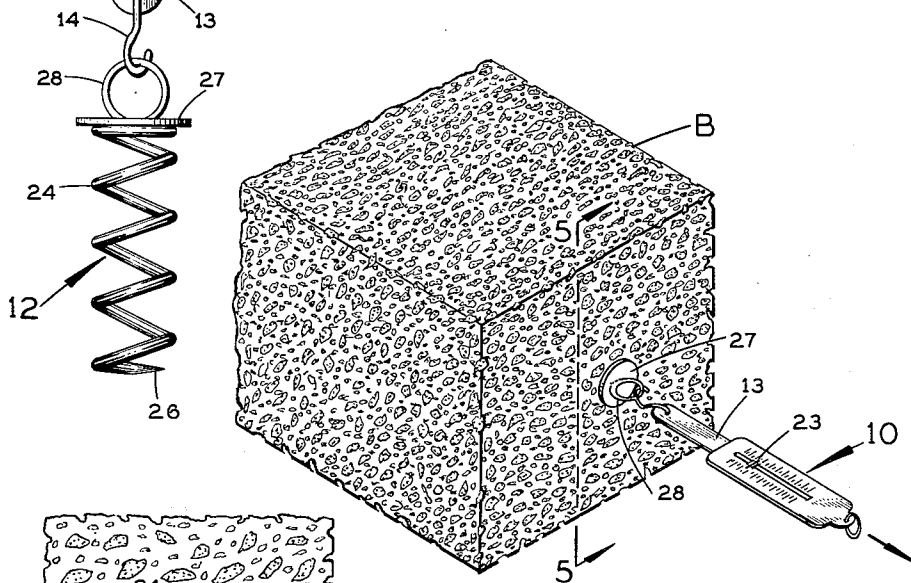


FIG. 4

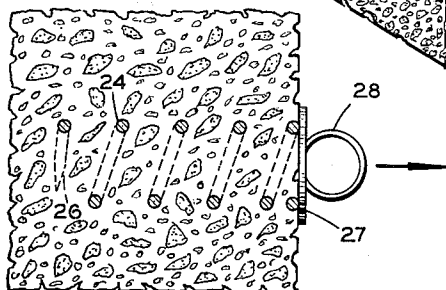


FIG. 5

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METHOD FOR TESTING REGENERATED CELLULOSE SPONGE

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The present invention relates generally to an improved materials testing method, and it relates more particularly to an improved method for rapidly determining the mechanical qualities of regenerated cellulose artificial sponge masses.

In the production of regenerated cellulose artificial sponge, a green viscose is produced in the usual manner by immersing cellulose sheets in a sodium hydroxide solution to produce alkali cellulose; excess sodium hydroxide solution is expressed from the alkali cellulose to effect a predetermined press ratio; the alkali cellulose is admixed and tumbled with carbon bisulfide to produce cellulose xanthate which is dissolved in a mild sodium hydroxide solution to result in the viscose. Crystals of sodium sulphate decahydrate and cut fibers of flax or hemp are uniformly distributed in the viscose to form a sponge forming mass which is deposited into large rectangular molds and heated by immersion in a hot liquid, subjected to steam or by passing an electric current therethrough whereby to coagulate the viscose, regenerate the cellulose and melt the sodium sulphate decahydrate. The resulting regenerated cellulose sponge block is then washed, bleached and at least partially dried. It is apparent that the above procedure is highly complex and by reason of the nature thereof and the raw materials employed, even under conditions of very close process control, there is a wide range in the physical properties of the end product, not only from batch to batch, but also from sponge block to sponge block and frequently in different parts of the individual sponge block. As a consequence, for proper product quality control it is necessary to test the sponge strength of each block.

Heretofore, a test sample of predetermined configuration and dimensions was cut from the heart of the sponge block and tension applied thereto in a predetermined direction until rupture occurs, the force required to rupture the sample, that is the tensile strength thereof, being a measure of the sponge block quality, the entire sponge block being accordingly classified. This procedure possesses many drawbacks and disadvantages. It is highly expensive, time consuming and inconvenient in that an appreciable quantity of sponge is wasted in obtaining the sample, considerable skilled labor is involved, and the respective sponge blocks are withheld for long times from further processing and production pending the testing of the samples. Moreover, inasmuch as the strength of the sponge varies in different parts of the block, the test sample is not necessarily representative of the entire block and as a result this procedure often results in the erroneous classification of a sponge block. It is impractical to take and test a plurality of samples from different parts of the block since the cost and inconvenience would be untenable. Moreover, small sponge blocks produced concurrently with the production sponge blocks are not reliable counterparts of the main blocks for tensile test purposes and are expensive to prepare.

It is therefore a principal object of the present invention to provide an improved materials testing method.

Another object of the present invention is to provide an improved method for testing the strength of artificial sponge.

Still another object of the present invention is to provide an improved method for locally measuring the

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strength of a block of fiber reinforced regenerated cellulose sponge without the necessity of cutting a sample section from the block.

A further object of the present invention is to provide a non-destructive method for measuring the strength of artificial regenerated cellulose in a large block in the absence of cutting the block, the test procedure being applicable to different areas of the block.

Still a further object of the present invention is to provide an improved method of the above nature which is inexpensive, simple, accurate, rapid, versatile and does not require the use of skilled labor.

The above and other objects of the present invention will become apparent from a reading of the following description taken in conjunction with the accompanying drawing wherein:

FIGURE 1 is a front elevational view of a measuring apparatus embodying the present invention;

FIGURE 2 is a perspective view of the follower member forming a part thereof;

FIGURE 3 is a top plan view of the test or coupling element;

FIGURE 4 is a perspective view illustrating the use of the improved apparatus; and

FIGURE 5 is a sectional view taken along line 5-5 in FIGURE 4.

It has been found that the force required to pull an elongated member in a direction transverse thereof, through a sponge material, is a measurement of the mechanical strength of the sponge material and may be rapidly and easily determined with simple equipment and without the necessity of producing or cutting samples of the material of predetermined dimensions and configuration.

Thus, in a sense the present invention contemplates the provision of the improved method of testing the physical strength of a pierceable material comprising longitudinally inserting an elongated element into said material and measuring the force required to transversely pull said element from said material. This method may be advantageously practiced by employing an improved materials testing device in which the elongated member is a helical element which may be screwed into the material and a force measuring device is connected to the helical element at a point along the axis thereof and the pulling force is applied axially to the helical element through the force measuring device.

According to a preferred form of the present invention the helical element is formed of wire and is pointed at its leading end and provided at its trailing end with stop defining shoulder and a coupling member in the form of a ring which is secured to the helix at a point along its axis. The force measuring device is spring balance the extensible shaft of which carries a hook which releasably engages the helix coupling member.

The spring balance is provided with a retractable follower which indicates the maximum pull applied thereto.

The configuration and dimensions of the helical member may be as desired and depends on the material being tested. In the case where the material being tested is a fiber reinforced regenerated cellulose sponge, the helical member is preferably between 4 and 10 centimeters in length, between 0.5 and 2 centimeters in diameter, the diameter or radial thickness of the wire forming the helix is between 0.2 and 0.5 centimeter and the number of convolutions is between 4 and 6. The device is employed in the practice of the subject method by merely screwing the helical element into a face of the sponge block until stop member firmly abuts the block face, attaching the spring balance to the coupling member and pulling on the spring balance at a slowly increasing rate

until the helical member is withdrawn. The force measured by the spring balance as indicated by the follower is an indication of the strength of the sponge material.

Referring now to the drawings which illustrate a preferred embodiment of the present invention as applied to the testing of regenerated cellulose sponge blocks, the reference numeral 10 generally designates the improved device which includes a spring balance 11 of substantially conventional construction and a helical test member 12, somewhat of the configuration of the common corkscrew. The spring balance 11 is provided with a body member which houses, in the usual fashion, an extensible spring responsive to the force applied thereto by way of an axially movable shank 13. Connected to the shank 13 is a coupling hook member 14. The spring balance 11 has a front wall 16 provided with a longitudinal slot 17 and carrying suitable indicia 18 along the length of the slot. A pointer 19 is carried by the upper part of the shank 13 and extends through and slides along the slot 17 in registry with the indicia 18.

A follower member 20 slideably registers with the slot 17 and is disposed in advance of the pointer member 19. The follower member 20 consists of a block 21 having formed in the sides thereof grooves 22 which frictionally engage the longitudinal edges bordering the slot 17 to permit the movement of the follower member 20 along the slot but retain the follower member in a stationary position in the absence of a force applied thereto. Thus, the follower member 20 indicates the maximum movement of the pointer 19 and may be reset as desired. The follower member 20 carries a laterally extending pointer 23 which registers with the indicia 18.

The test member 12 includes a helical member 24 formed preferably of stiff wire or rod which is pointed at its leading end 26 to facilitate the screwing of the helix 24 into the material being tested. Affixed to the trailing end of the helix 24 and perpendicular to and concentric with the longitudinal axis of the helix 24 is a stop member defining disc 27, to the center of the outer face of which is attached a longitudinally extending coupling ring 28. The hook member 14 releasably engages the ring 28, and a handle member or ring 29 is connected to the opposite end of the spring balance 11 by means of an opening formed in the front wall 16 to facilitate the manual application of a pull to the test member 12 by way of the spring balance 11.

In the measuring of the strength of a regenerated cellulose sponge material in the form of a large block B of rectangular configuration, with the device 10 described above and in accordance with the present process, the test member 12 is screwed into a face of the block B until the stop member 27 firmly abuts the block face and no appreciable stress is imparted to the sponge material. The hook 14 is then inserted through the ring 28 and the spring balance is pulled outwardly along the test member helix axis by means of the handle 29 with a gradually increasing force, thereby applying a corresponding gradually increasing axial pulling force to the test member 12, until the test member is withdrawn from the block B. The force necessary to withdraw the test member is indicated by the follower pointer 23 and is an

indication of the strength of the sponge material. The follower is then reset and the above procedure may be repeated at other points on the block to establish the significance of the readings and the uniformity of the material. By reason of the ease and rapidity of the subject procedure, where a reading appears to be outside the normal range, it is a simple matter to make additional measurements.

As a specific example, the test member helix was 4.5 centimeters long, had an outside diameter of 0.88 centimeter, had 4 convolutions and was formed of wire of 0.25 centimeter diameter. It was found that highly representative measurements could be obtained at points along approximately a diagonal of an endface of the block B at the center thereof, and at centrally offset points no closer than about three inches from the edges of the block end face. While the sponge block may be classified as desired in accordance with the test member withdrawal pull it has been ascertained that for commercial purposes, where the withdrawal pull under the above conditions is under about 20 pounds the sponge material may be classified as second quality and where the withdrawal pull averages about 27.5 pounds and above the sponge material may be classified as first quality and withdrawal pulls between 20 and 27.5 pounds may be subdivided into one or more classifications as desired.

It has been found that the measurements made in the above manner furnish an accurate and highly reproducible indication of the mechanical strength of the sponge material and that tests need only be made at one end of each block. The present testing procedure is simple and rapid and does not interfere with or in any way hinder the normal production flow.

While there have been illustrated and described preferred embodiments of the present invention it is apparent that numerous alterations, omissions and additions may be made without departing from the spirit thereof.

What is claimed is:

1. The improved method of testing the physical strength of a regenerated cellulose sponge material in block form comprising screwing a wire helical element into a face of said block and measuring the force required to axially pull said helical element from said block.

2. The method according to claim 1 wherein said element is screwed into a plurality of spaced points in an end face of said block and the force required to axially pull said element from said block at each of said points is measured.

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