

Feb. 18, 1969

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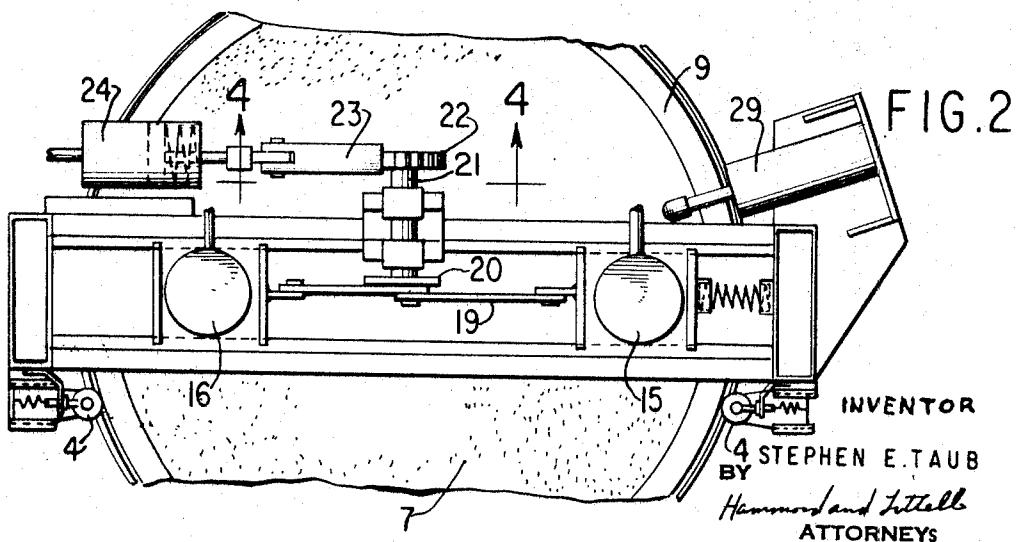
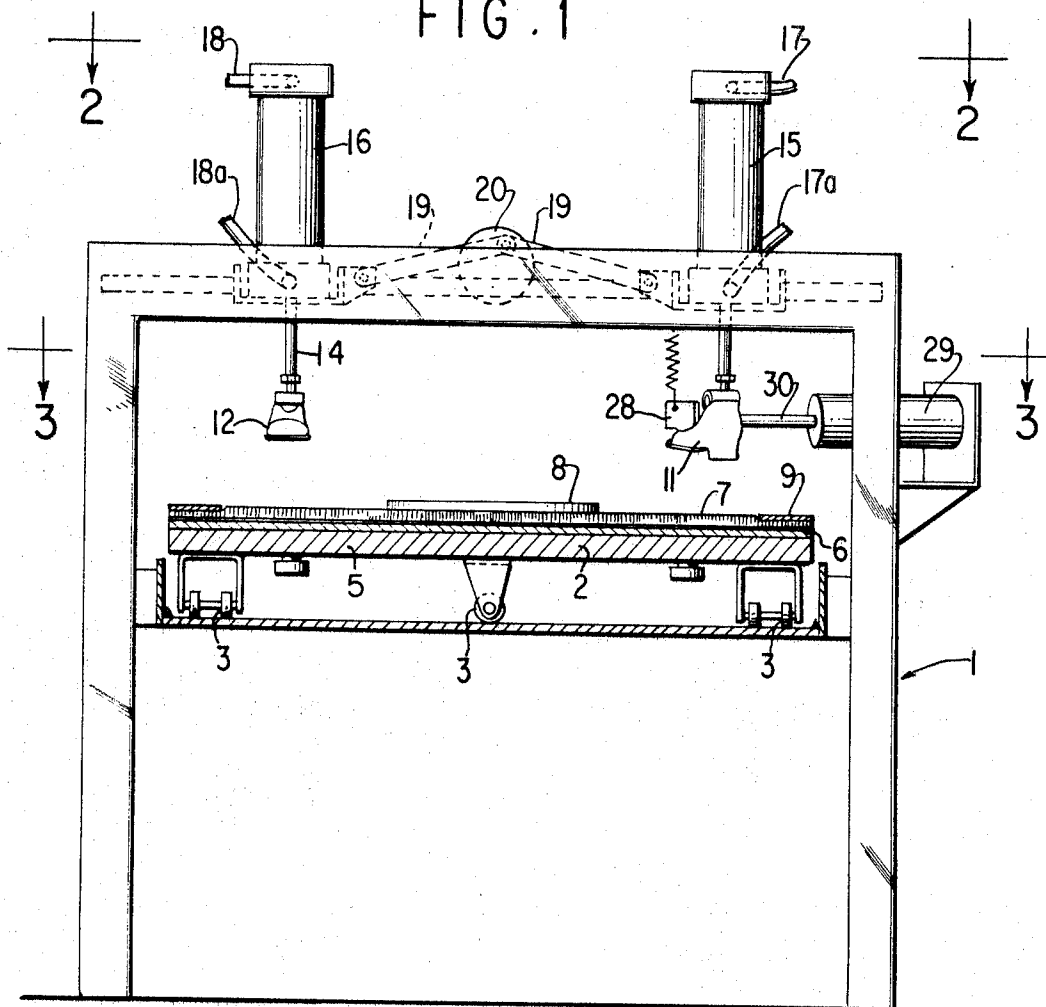
3,427,859

WEAR-TESTING MACHINES

Filed April 26, 1967

Sheet 1 of 3

FIG. 1



Feb. 18, 1969

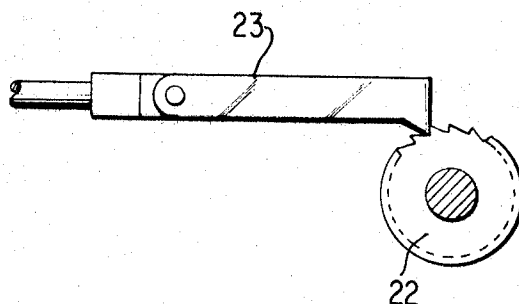
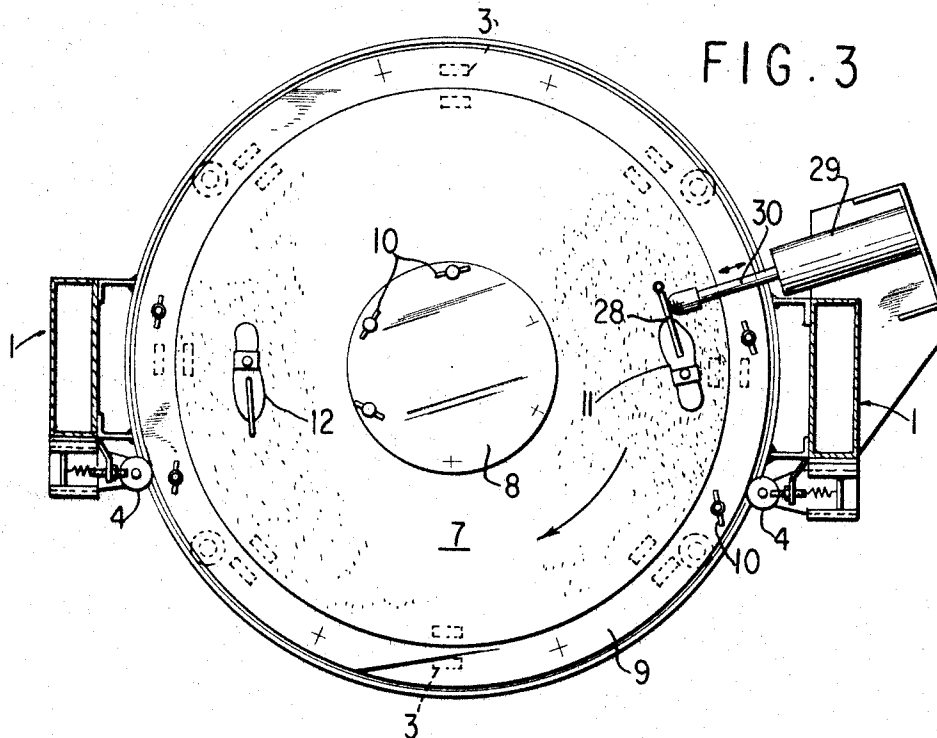
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Sheet 2 of 5



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Sheet 3 of 5

FIG. 5

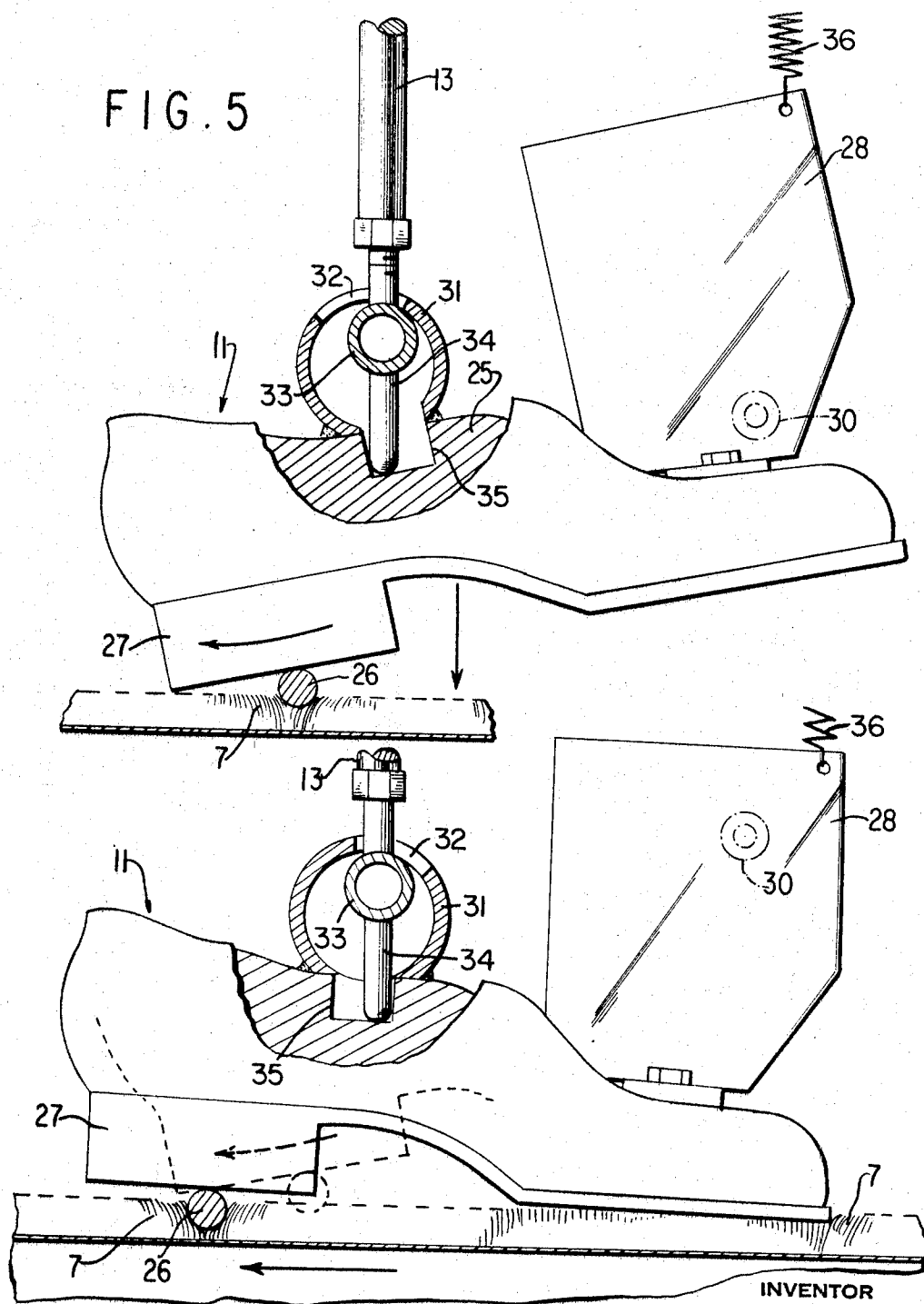


FIG. 6

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1

3,427,859

WEAR-TESTING MACHINES

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4 Claims

ABSTRACT OF THE DISCLOSURE

The invention comprises a wear tester for floor coverings which simulates wear induced by normal walking. A wear member strikes the covering first on its heel, and then the heel is raised as the toe strikes the covering. This motion also induces rotary movement to the covering support. Twisting action is provided to the wear member while it is in contact with the covering to simulate wear induced as a person turns a corner.

Prior art

Various wear-testing machines are known, but they have not been successful. The pressure on the carpeting and the shape of wear tool are not variable on most of the known testing machines. The type of wear induced by the known testing machines does not resemble the wear induced by a person walking on the carpet and the results obtained by the testing machines do not correspond to the results obtained under actual use conditions.

Objects of the invention

It is an object of the invention to provide a novel wear-testing machine which induces wear similar to that of actual use.

It is another object of the invention to provide a novel testing machine for producing wear on floor covering with reproducible results.

These and other objects and advantages of the invention will become obvious from the following detailed description.

The invention

The apparatus of the invention for wear-testing floor covering comprises a rotatable table provided with means for securing a test specimen thereon, at least one shoe means mounted over the portion of the said table where the test specimen lies, means for raising and lowering said shoe means whereby first the heel portion of the shoe means contacts the test specimen under pressure and then the sole portion of the shoe means contacts the test specimen and means for varying the pressure of the shoe means on the test specimen, the said table being rotated by the movement of the shoe means.

The rotatable table may be round and provided about its bottom circumference with wheels or bearings riding on the support means for the table. This arrangement allows the table to remain level when under pressure from the shoe means and to remain rotatable. In a preferred embodiment, the table is provided with means to vary the amount of friction between the table and the wheels so that the amount of force necessary to rotate the table can be varied. This has the advantage that the amount of wear on the test specimen can be varied since as the amount of drag increases, the more energy is required by the shoe means to rotate the table which increases the friction and, therefore, wear between the shoe means and the test specimen.

While the round table may be made of any hard material, it is preferably made of hard metal and is provided

2

with a top layer of regular wood flooring in order to provide a base as similar as possible to the type of base a carpeting is usually used with. For floor coverings which are to be used on a hard surface such as a concrete or stone floor, the wood layer may be omitted to provide a similar hard base for the test specimen.

The test specimen with or without an under layer is preferably the same size and shape as the rotatable table and is tightly held thereon. One convenient means for holding the test specimen in place is two metal rings which are bolted or screwed to the table, one ring being about the circumference of the table and the second ring about the center of the round table.

The shoe means which are used to induce wear on the test specimen and to rotate the table are mounted above that portion of the table on which the test specimen lies and preferably there are two shoe means on opposite sides of the table so that a greater degree of wear can be induced in a given period of time. The shoe means may be in the shape of a normal man's shoe or a woman's high heel shoe in order to determine different types of wear to which the test specimen will be subjected. In a preferred embodiment, the shoe means may be laterally adjustable so that a wide area of wear may be induced on the test specimen.

At least one of the shoe means is adapted so that as the shoe is lowered to the test specimen on the table first the heel of the shoe comes in contact with the test specimen and the sole of the shoe means comes in contact with the test specimen while the heel is lifted off the test specimen. This arrangement not only simulates the wear induced by normal walking, but it also provides a force which turns the table so that the next lowering of the shoe means will come in contact with another portion of the test specimen. This result can be simply achieved by providing the shoe means with a bar or cylinder across the middle or forward portion of the heel of the shoe means so that the bar or cylinder acts as a fulcrum for the shoe means.

In a preferred embodiment of the invention, the wear-tester apparatus is provided with means for twisting the sole of the shoe means while it is in contact with the test specimen which movement simulates the wear induced by a person turning a corner. One simple means for providing this twisting action is to provide the shoe means with a metal plate on the toe of the shoe means which is synchronized to engage a push rod in a pneumatic cylinder when the sole is in contact with the test specimen, the said push rod pushing the toe plate laterally to provide the twisting movement. The degree of twist can be easily varied by changing the length and/or speed of stroke of the push rod and/or changing the lateral position of the shoe means.

The raising and lowering of the shoe means may be effected by attaching the shoe means to rods connected to overhead cylinders which may be operated hydraulically or pneumatically to force the shoe means upon the test specimen under pressure and then to raise the shoe means for the next cycle. The amount of pressure applied by the said cylinders is preferably varied over a wide range, i.e., 1 to 5,000 pounds per square inch, to induce different degrees of wear on the test specimen. The said cylinders are preferably laterally adjustable so that the shoe means may be moved laterally.

In a preferred embodiment of the wear-testing apparatus, the speed of the raising and lowering of the shoe means should be variable so that the apparatus can simulate a varying gait, ranging from a slow walk to a fast walk or running.

If desired, the apparatus may be provided with an automatic counter to determine the number of times the shoe

means comes in contact with the test specimen and may be further provided with an automatic shut off means so that the apparatus will shut itself off after a predetermined number of steps.

The advantage of the apparatus of the invention resides in the fact that the fiber damage, soiling and wear of the resilient carpeting induced by the apparatus is the same as that produced under actual use conditions since the movement of the shoe means is the same as that of a person walking. The test results obtained in a matter of two or three days with the apparatus of the invention would require several years of wear under actual use conditions. Moreover, the wear results are reproducible so that different types of floor coverings can be accurately compared for their durability. The degree of wear of the resilient floor covering can be determined by visual observation, the loss in weight of the covering and/or the weight of detritus collected. The floor coverings can be rated for different characteristics such as frictional resistance between underlay and carpeting, compression set and carpet life.

Referring now to the drawings:

FIG. 1 is a cross-sectional view of one embodiment of the wear-testing machine of the invention.

FIG. 2 is a partial plan view of the same embodiment along line 2—2 of FIG. 1, and FIG. 3 is a plan view of the same embodiment along line 3—3 of FIG. 1.

FIG. 4 is a plan view along the line 4—4 of FIG. 2, showing the means for laterally moving the shoes.

FIG. 5 is a cross-sectional view of the shoe means as the heel first comes in contact with the test floor covering and FIG. 6 is a cross-sectional view of the shoe means as the sole comes in contact with the test floor covering just before the shoe means is twisted.

Referring to the drawings in detail, the entire apparatus is supported by frame 1. Round table 2 is supported on a plurality of wheels or rollers 3 which are arranged about the bottom circumference of the table 2 so that the table 2 will rotate due to the movement of the shoe means. Additional wheels 4 are positioned horizontally about the outer circumference of table 2 to keep the table in a fixed lateral position. The table 2 is comprised of a metal base 5 and a wood base 6 thereover which simulates a normal wood floor. To simulate a concrete or stone floor, the wood base 6 is removed. The test specimen 7 of resilient floor covering, with or without an underlay, is laid on the table 2 and is held securely in position thereon by inner metal ring 8 and outer metal ring 9 which are bolted to the table with bolts 10. This prevents lumps or wrinkles forming in the test specimen during the test operation.

Shoes 11 and 12 are mounted directly above the portion of test specimen 7 which is to be subjected to the wear tests and are preferably on opposite sides of the table 2. The said shoes are connected by rods 13 and 14 to cylinders 15 and 16 which are preferably operated pneumatically and which are synchronized so that both shoes are raised and lowered together. The compressed air or hydraulic fluid is fed under pressure to cylinders 15 and 16 from a supply source (not shown) by tubes 17 and 17a and 18 and 18a to force shoes 11 and 12 upon the test specimen under pressure, hold them in position and then raise them for the next cycle. The pressure can vary from about 1 to 5,000 p.s.i. The speed of raising and lowering the shoe means is adjusted by varying the operation of the cylinders.

Cylinders 15 and 16 are preferably laterally adjustable and are so mounted on frame 1, whereby a broadened area of wear is obtained which gives more accurate results since floor coverings are not always completely uniform. FIGS. 2 and 4 illustrate one means of moving the shoes laterally after each raising and lowering of the shoe. Each cylinder is attached by a metal rod 19 to a disc 20, said rods being attached offset from the center of disc 20, whereby turning of disc 20 will bring together or move apart cylinders 15 and 16. Disc 20 is attached by shaft 21

to notched gear 22 which is turned by the back and forth motion of rod 23 attached to piston 24. As gear 22 is rotated, one notch for each raising and lowering of the shoes, the disc 20 correspondingly rotates in increments whereby the cylinders are moved laterally in increments towards or away from each other. By adjusting the radial placement of rods 19 on disc 20, the lateral movement of the shoes by notched gear 22 may be varied.

FIGS. 5 and 6 illustrate the movement of the shoes as they come in contact with the test specimen 7 and a preferred connection with rods 13 and 14. Shoe 11 is provided with a solid block 25 inside thereof which is securely attached to rod 13 and the shoe is provided with a lateral metal cylinder 26 in the middle of the heel 27. A sleeve 31 is provided on the block 25 having an upwardly opening slot 32 which is adapted to receive the piston rod 13. An enlarged cylindrical portion 33 is secured on the free end of the piston rod 13 and is received within the sleeve. The cylinder includes a downwardly projecting rod 34 which fits within a notch 35 provided in the block 25. In the position illustrated in FIGURE 5 the heel of the shoe 11 is swung to a position lower than the toe portion and it is this position that first contacts the test specimen. As rod 13 comes down, the back of heel 27 and cylinder 26 contact the floor covering first and as rod 13 continues to descend, the cylinder 26 acts as a pivot with the back of the heel rising off the floor as the sole of the shoe and front portion of the heel come in contact with the floor covering. This movement causes the table 2 to rotate on rollers 3. By varying the amount of drag on the table, the degree of wear can be varied.

In order to simulate wear which occurs where a person turns a corner, shoe 11 is preferably provided with a metal plate 28 securely attached to the toe thereof. A pneumatic cylinder 29 with a push rod 30 is mounted so that push rod 30 can push on the plate 28 when the shoe 11 is in the position shown in FIG. 6, which twists the shoe to one side while under pressure. The amount of twist can be varied by changing the length and/or speed of stroke of push rod 30 and/or by changing the lateral position of the shoe. It should be apparent that to insure that the heel of the shoe first contacts the specimen a biasing member of some sort should be provided to maintain the position of the shoe in FIGURE 5 in the free state. In the preferred embodiment a spring 36 is secured at the upper portion of plate 28 and suitably secured at the other end to the frame. As the piston rod 13 retracts the shoe from its specimen contacting position, the spring 36 returns the shoe to the position illustrated in FIGURE 5.

The apparatus is preferably equipped with an automatic counter and an automatic shut off switch so that the number of steps by the shoes may be counted and the apparatus can be shut off after a predetermined number of steps. While men's shoes have been illustrated in the figures, women's shoes or simulations of shoes of any style can also be used.

Various modifications of the apparatus of the invention may be made without departing from the spirit or scope thereof and it is to be understood that the invention is to be limited only as defined in the appended claims.

I claim:

1. Apparatus for inducing wear in floor coverings comprising a rotatable table having a test specimen provided thereon, shoe means spaced from said specimen, means for mounting said shoe means for rotational movement about a first axis parallel to the plane of said table, means for biasing said shoe to a first position whereby the heel is nearest said specimen, means for moving said shoe means whereby the latter contacts said specimen, fulcrum means mounted on said heel whereby said shoe is rocked about said heel when the latter contacts said specimen to rotate said table.

5

2. Apparatus according to claim 1 wherein said fulcrum member is a cylinder having an axis parallel to said first axis.

3. Apparatus according to claim 1 including means for biasing said toe portion about an axis at right angles to said table whereby twisting is imparted to said specimen.

4. Apparatus according to claim 1 including means for moving said shoe means laterally of said table whereby an equal distribution of shoe contact is distributed over said specimen.

5

6

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