Aug. 5, 1930. C. E. CARPENTER 1,772,415

DEVICE FOR TESTING RELATIVE FRICTIONAL CHARACTERISTICS OF MATERIALS

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Fig. 1.

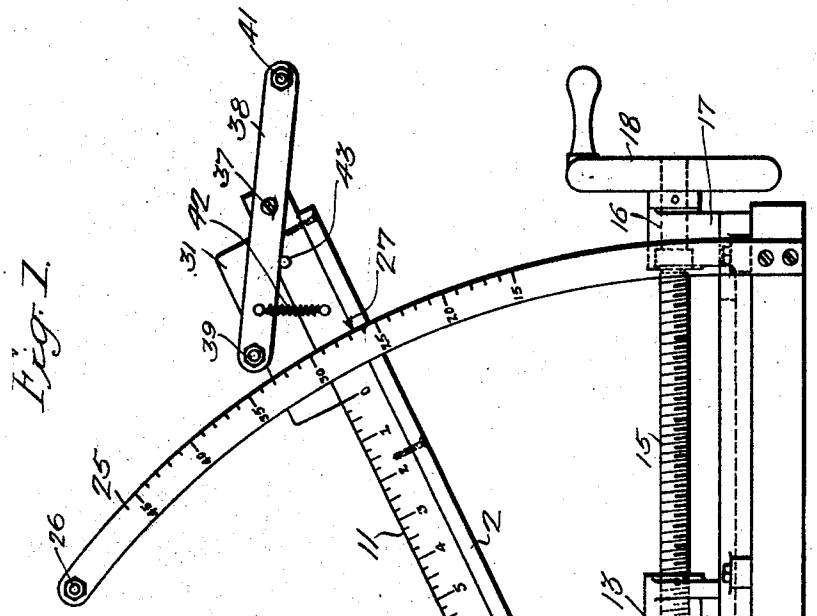
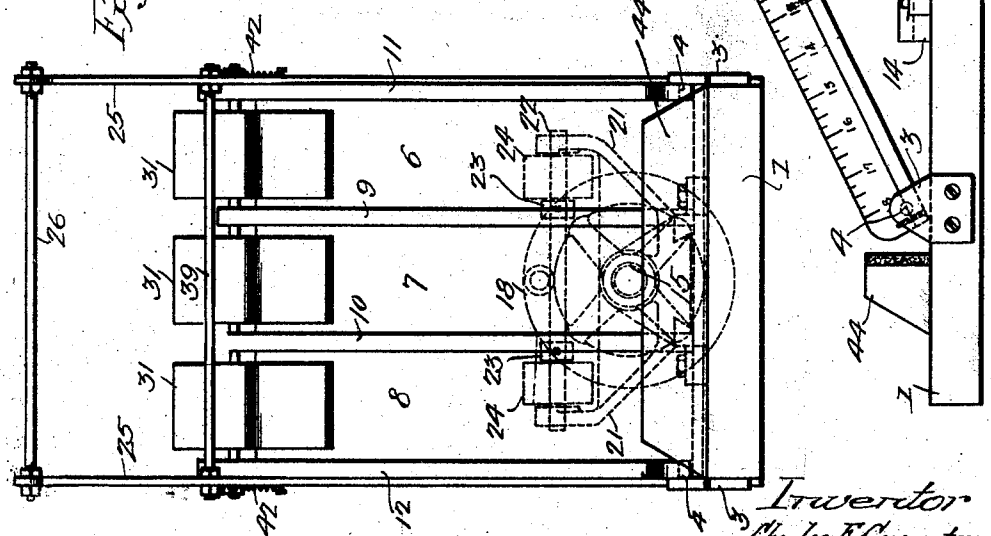


Fig. 2.



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Fig. 3.

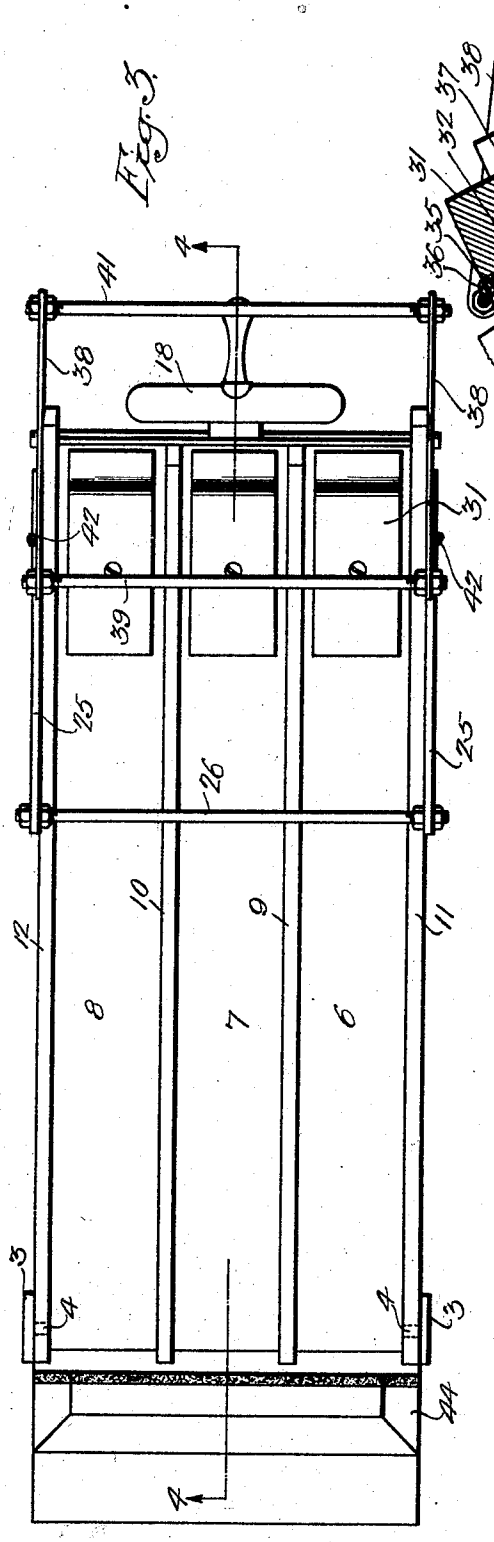
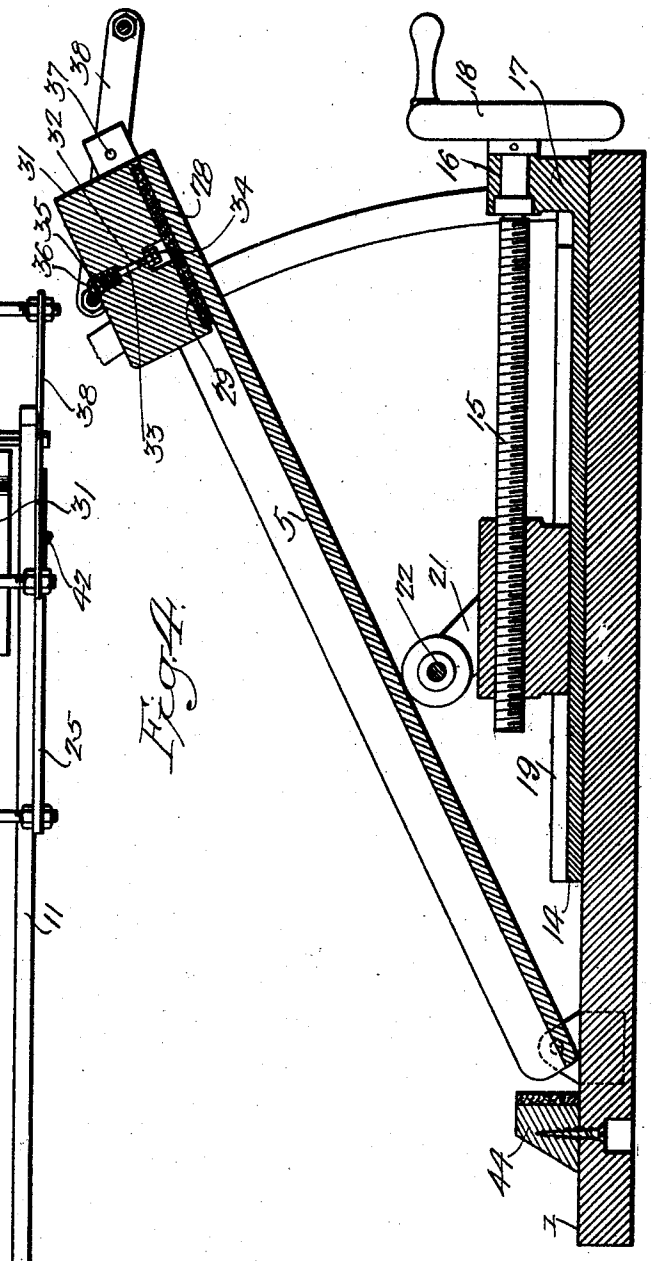


Fig. 4.



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UNITED STATES PATENT OFFICE

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DEVICE FOR TESTING RELATIVE FRICTIONAL CHARACTERISTICS OF MATERIALS

Application filed September 17, 1927. Serial No. 220,195.

The principal object of this invention is to provide novel apparatus affording a visible and comparative test of the friction characteristics of certain materials such for example as different types of leather used in the manufacture of power belting.

The invention resides chiefly in certain novel structural features whereby a simple practical and highly accurate device is provided for the stated purpose.

In the attached drawings:

Figure 1 is a side elevational view of a device made in accordance with my invention;

Fig. 2 is a front elevation of the device;

Fig. 3 is a plan view of the device, and

Fig. 4 is a section on the line 4—4, Fig. 3.

Referring to the drawings, the apparatus therein illustrated and constituting a preferred embodiment of my invention consists of a base member 1 upon which is pivotally mounted a member 2 constituting an inclined plane upon which the test specimens operate, as hereinafter set forth. The member 2 in the present instance is in the form of a flat plate which is pivotally secured at its lower end between brackets 3 on the base plate 1. In the present embodiment, pins 4 project inwardly from the brackets 3 into cylindrical recesses in the opposite sides of the member 2, and it will be noted that the common axis of these pivot pins 4 lies in the plane of the upper flat surface 5 of the member 2 upon which the test specimens slide, as shown in Fig. 4. This upper surface 5 of the member 2 is divided, as shown in Figs. 2 and 3, into three longitudinal ways 6, 7 and 8, by means of vertical partitions 9 and 10, and similar elements 11 and 12 are secured at the longitudinal edges to form outer barriers for the ways 6 and 8. The elements 11 and 12 have their outer faces suitably graduated, as shown in Fig. 1, the graduations starting at a point short of the upper ends of the elements and extending in the present instance to the bottom. Any desired unit of linear measurement may be used as the basis for these graduations, such for example as inches or centimeters, or an entirely arbitrary unit may be employed.

The member 2 is normally supported in an inclined position by means of a support member 13 which is slidably mounted in a dovetailed guide 14 on the base plate 1. The support member 13 comprises, as shown in Fig. 4, a body member having an opening therethrough in which is threaded a screw or threaded shaft 15, this shaft 15 being journaled at its rear and unthreaded end in a bearing 16 in an upwardly projecting portion 17 of the guide member 14, and at the rear extremity of the shaft 15 is attached a hand wheel 18 by means of which the shaft may be rotated. This shaft with the hand wheel 18 provides means for advancing or retracting the member 13 in the dovetailed groove 19 of the guide 14 in obvious manner. The support 13 also comprises at opposite sides upwardly projecting arms 21 whose upper ends are joined by a transverse shaft or pin 22, and rotatably mounted on this shaft 22 and held at the opposite extremities thereof by means of collars 23 adjustably secured to the shaft are rollers 24, 24 which engage the under flat side of the member 2 and upon which the member rests. It will be apparent that as the support member 13 is adjusted in the guide 14 in the manner described above, the inclination of the member 2 will be varied.

Extending upwardly from the opposite sides and rear end of the base member 1 is a pair of arms 25, these arms being drawn on the arc of a circle whose center is in the axis of the pins 4 and being joined at their upper ends by means of a cross bolt 26. As best shown in Fig. 1, the rear end of the member 2 slides between the arms 25, and the outer faces of the arms are graduated to afford an indication of the degree of inclination or arc of elevation of the member. It will be noted by reference to Fig. 1 that the graduations on the arms 25 are at one edge thereof and that a suitable cooperating marking 27 is placed on the sides of the member 2 in a position coresponding with, or in the plane of, the upper surface 5 of the member 2 on which the test specimens rest. The graduations on the arms 25 may be such as to indicate the inclination or arc of elevation of the member

2 in degrees, or may be based on an arbitrarily selected unit.

The test specimens, see Fig. 4, which may be in the form of flat rectangular pieces 28 of the materials to be tested preferably occupy a correspondingly shaped recess 29 in the underside of weight elements 31. These weight elements in the present instance are provided with a passage 32 in which is mounted a bolt 33. The ends of the passage 32 respectively at the upper and lower surface of the block 31 are countersunk to provide in one instance a recess for reception of nuts 34 which hold the bolt in place, and in the other instance for reception of a spring 35 confined between the head 36 of the bolt and the bottom of the countersink and exerting a pressure resiliently holding the bolt in an elevated position in which, as clearly illustrated, the head 36 projects slightly above the upper surface of the block.

Extending between the upper projecting ends of the side elements 11 and 12 is a rod 37 on the outer projecting ends of which are pivotally mounted the side links 38 of a member comprising these side links, together with connecting rods 39, 41, which join the corresponding ends of the links together. The connecting rod 39 of this member is so positioned as to occupy a position overlying the tops of the blocks 31 when the latter are at the top of the inclined plane, and springs 42 connected to the side pieces 11 and 12 and to the forward ends of the links 38 resiliently hold the connecting rod 39 against the tops of the blocks 31, as shown in Fig. 4. Stops 43 are provided for the links 38 which limit the downward movement of the forward ends of the links, and when the blocks 31 are withdrawn hold the forward ends of the links in a position such that the lower edge of the connecting rod 39 still occupies a position substantially in the plane occupied by the upper surfaces of the blocks 31 when the latter are at the upper end of the member 2.

As indicated in Fig. 4, the connecting rod 39 functions to retain the blocks 31 at the upper end of the inclined plane by engaging the projecting heads 36 of the bolts 33, and the bolts are preferably so placed in the blocks that the forward edges of the latter when retained as described lie on a line with the zero or initial mark of the scales on the side pieces 11 and 12, as shown in Fig. 1. By depressing the connecting rod 41 at the rear end of the links 38, the connecting rod 39 will be elevated to release the blocks 31 which are then permitted to move down the inclined plane. The arrangement is such that it is only necessary to slide the blocks upwardly on the plane sufficiently far to bring the heads of the bolts 36 above the position of the rod 39, to have the blocks automatically retained at the upper end of the plane until the rod 39 is elevated as described above.

On the base plate 1 and at the bottom of the member 2 is a stop element 44 against which the blocks 31 impinge as they approach the bottom of the plane.

It is obvious that the material of which the member 2 is made will affect the action of the test specimens on the plane. Where the device is used to test leather belting it is desirable to form the surface on which the blocks slide of material or materials of which pulleys are commonly formed and to have the surface conform as closely as possible in physical characteristics to the pulley surface. There is to be no limitation as to the physical characteristics of the surface of the member 2 on which the blocks slide.

Preferably the ways 6, 7, and 8 are made of such width that there is no likelihood under normal conditions of the blocks coming in contact with the partition elements as they slide down the plane. In the other instances it may be desirable to so form the partition elements or the blocks that if contact is made the area thereof shall be a minimum.

The operation of the device will be apparent from the foregoing description. With the different test specimens 28 occupying the recesses in the under faces of the blocks 31 and the member 2 elevated to the desired inclination, release of the blocks 31 as described permits them to move down the plane, and the different rates of movement of the blocks, or the time required to pass down the plane will afford an accurate indication of the frictional characteristics of the respective test specimens; or the plane may be lowered by manipulation of the hand wheel 18, and with the test specimens in position at the upper end of the plane, the latter may be gradually elevated, note being made of the respective angular positions of the member 2 at which the different specimens start moving down the plane. In this instance, of course, it will be necessary to render inoperative the block-retaining means at the top of the plane so that the specimens are free to move down the plane when the inclination is such that the frictional resistance of the specimen is overcome. The respective inclinations of the plane at which the different specimens start moving down the plane afford a further comparative test of the frictional characteristics of the said specimens. Obviously the device affords a means for testing the frictional inertia of materials, that is the frictional resistance opposing initial movement when the body is at rest, sometimes called static friction, as well as the frictional characteristics after motion is once initiated.

I claim:

1. In a friction-testing machine, the combination with a base, of a member pivotally

secured at one end to the base and constituting an adjustable inclined plane, partition elements dividing the plane into a plurality of separate ways, means for vertically adjusting the free end of said member, a plurality of specimen-retaining elements slidable on the plane and in the respective ways, and a common retainer for said members at the upper end of said plane.

2. In a friction-testing machine, the combination with a base, of a member pivotally secured at one end to the base and constituting an adjustable inclined plane, the axis of said pivot lying in the plane of the upper surface of said member, a specimen-holding block slidable on the said upper surface of said member, means for vertically adjusting the free end of said plane member, and a relatively fixed member on the base graduated and adapted to cooperate with the said pivoted member to give an indication of the inclination thereof in any adjusted position.

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