

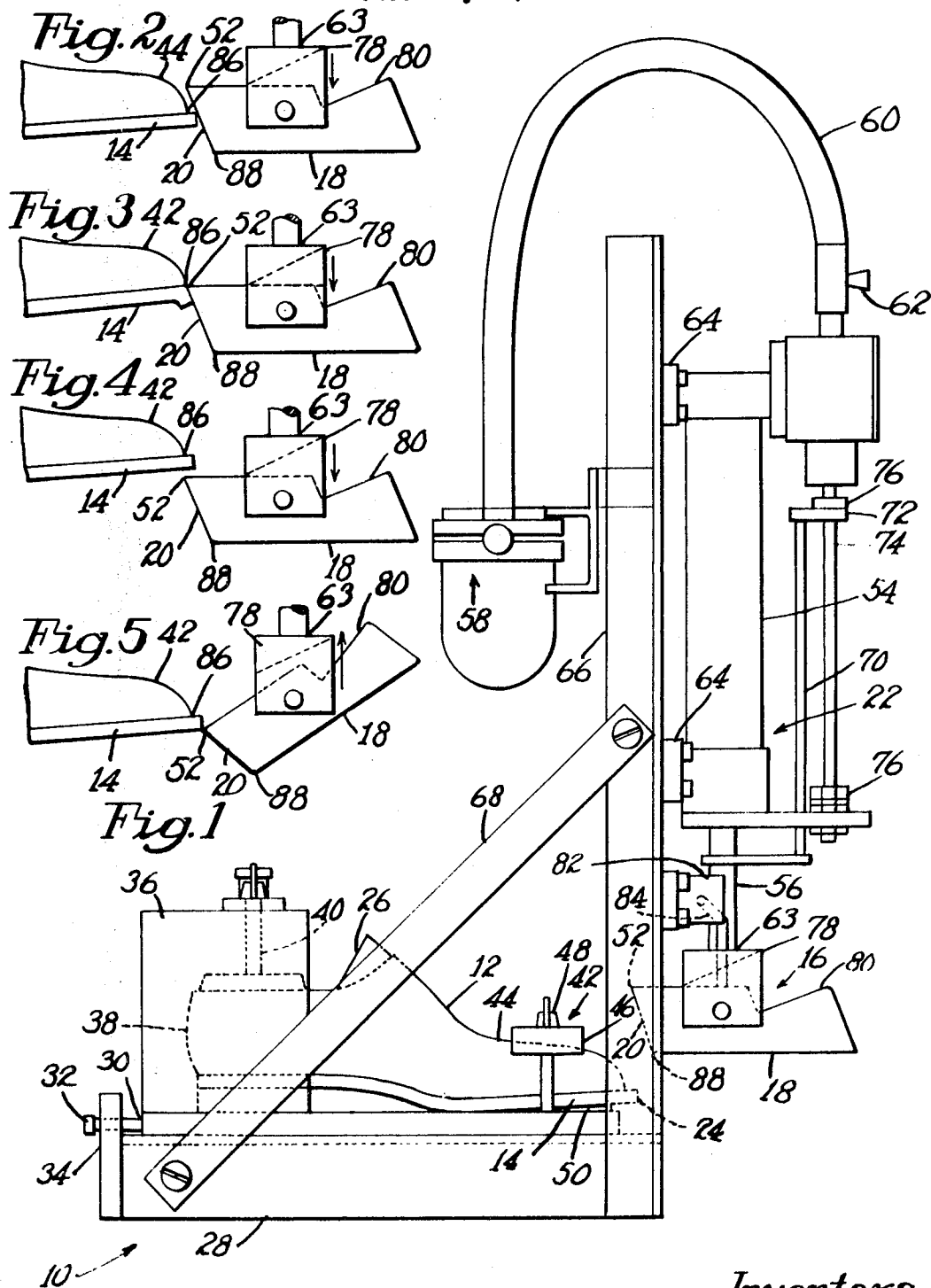
Sept. 28, 1971

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3,608,372

TESTERS FOR SHOES

Filed May 15, 1970



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3,608,372

TESTERS FOR SHOES

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Filed May 15, 1970, Ser. No. 37,513

Int. Cl. G01n 3/36

U.S. Cl. 73—150

5 Claims

ABSTRACT OF THE DISCLOSURE

A dynamic tester for determining resistance to cell-tearing separation of a resilient cellular elastomer outsole and a shoe upper at the toe portion of a shoe including a shoe holding device and a device for flexing edge extension portions of the outsole at the toe portion repeatedly in a direction to create separative stress.

FIELD OF THE INVENTION

This invention relates to devices for testing strength of attachment of outsoles to shoe uppers.

DESCRIPTION OF THE PRIOR ART

At the present time the effectiveness of bonding between flexible cellular elastomer outsoles particularly polyurethane foam outsoles and shoe uppers is tested by applying force to strip the outsole away from the shoe upper. In one such test, the forward end of a shoe, mounted on a last is disposed with the sole on a fulcrum, the toe is pushed forward to bring the bond line between upper and sole into register with a wedge member and the heel end of the shoe is then pushed forward and downward to cause the wedge member to separate the outsole from the upper. A gauge connected to the wedge member measures the force necessary to separate the sole from the upper. Such tests provide important information on the performance to be expected of a shoe in normal walking. However, flexible cellular elastomer soles have shown a tendency to separate progressively from the shoe upper at the extreme forward portion of the shoe and this tendency is not closely correlated with the bond strength test determined by present devices.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a dynamic tester providing a useful measure of the resistance to separation of the joint between a shoe upper and a flexible cellular elastomer outsole at extreme forward portions.

To this end and in accordance with a feature of the present invention there is provided a tester constructed to apply repeated distorting and separative stress to the outsole at the forward portion of a shoe.

BRIEF DESCRIPTION OF THE DRAWING

The invention will be described in connection with the attached drawing forming part of the disclosure of the present case in which:

FIG. 1 is a diagrammatic side elevational view of a tester according to the present invention;

FIG. 2 is a fractional side elevational view on a larger scale with parts broken away showing at a stage in the movement of the stress applying member of the tester where the member makes first contact with the forward portion of the outsole of a shoe;

FIG. 3 is a fractional side elevational view on the scale of FIG. 2 and with parts broken away showing the distortion of the outsole of a shoe by the stress applying member of the tester at a further stage;

FIG. 4 is a fractional side elevational view on the scale

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of FIG. 2 and with parts broken away showing the position of the stress applying member of the tester after passing and distorting the outsole and before returning to its initial position; and

FIG. 5 is a fractional side elevational view on the scale of FIG. 2 and with parts broken away showing the stress applying member being displaced around the outsole of a shoe in returning to its initial position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1 the tester of the present invention includes a support 10 for clamping a shoe 12 to be tested in position for application of stresses against the outsole 14 and a striker 16 including a stress applying member 18 having a sole edge engaging face 20 and a driving mechanism 22 to move the stress applying member 18 repeatedly in a path in which the sole edge engaging face 20 will apply stress to the forward edge portions 24 of the outsole 14.

Significant reproducible results from the tester require that the shoe upper 10 be supported in a manner which substantially prevents flexing. In general it is preferred to subject the shoe to testing while mounted on a rigid last or foot form 26 and the shoe support 10 of the embodiment shown in FIG. 1 is arranged for this factor. It will be understood that other devices for holding the shoe rigid may be used. The shoe support 10 includes a rigid base plate 28 on which is mounted a slidable plate member 30 which is adjustable toward and away from the stress applying member 18 by an adjusting screw 32 mounted in a bracket 34 at the rear end of the base plate 28. A U-shaped member 36 is adjustably mounted on the slidable plate and dimensioned to allow insertion of the heel end 38 of a lasted shoe 12 between the slidable plate 30 and the upper portion of the U-shaped member 36. A last clamp plug 40 is mounted in the upper portion of the U-shaped member 36 in position to be screwed down to force the heel end 38 of the lasted shoe upper 12 firmly against the slidable plate 30 to prevent movement of the lasted shoe upper relative to the plate.

A forward clamp member 42 also adjustably secured to the slidable plate 30 with dimensions enabling the forward portion 44 of a shoe 12 to be inserted is provided with a pressure member 46 which can be urged against the shoe upper by a screw 48 threaded in the upper portion of the clamp 42. Preferably the base plate 30 is supplied with a toe support wedge 50 which is adjustable lengthwise of the slidable plate 30 for adjustment into contact with the upwardly curved portion forward of the ball of the outsole 14 of a lasted shoe upper 12 mounted in the shoe support.

The stress applying member 18 presents a sole edge engaging face 20 with the face transverse to the lengthwise axis of the shoe 12 and inclined with the upper portion nearer the shoe than the lower portion. The relation of the shoe 12 and the sole edge engaging face 20 is adjusted such that the nearest edge, that is, the upper edge 52, of the face will just graze the toe of the shoe upper 12 in movement of the stress applying member 18 along its predetermined fixed path as shown in FIGS. 2 and 3.

Any suitable driving mechanism 22 adapted to move the stress applying member in a fixed path at controlled speed and frequency may be used. The driving mechanism shown in the drawing employs a cylinder 54 constructed and arranged to reciprocate a piston and piston rod 56 using air pressure as the source of energy. Air for driving the piston in the cylinder 54 is supplied from a pressure regulated air source 58 through the connector hose 60 to the upper end of the cylinder. A shut off valve 62 is provided between the hose and the top of the cylinder. The

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stress applying member 18 is mounted on the end 63 of the piston rod 56. The cylinder 54 is rigidly supported by bracket members 64 secured to upright members 66 fixed to the base plate 28 and braced by the angle bars 68 which extend from a midportion of the upright members 66 to the rear portion of the base plate 28. The length of stroke of the piston is determined by the member 70 fixed at one end to the piston rod 56 and with its other end terminating in a ring 72 traveling on a valve control rod 74. Adjustable stops 76 are provided on the valve control rod 74 such that the ring moves the control rod 74 to reverse the direction of air supply on contact with the stops.

In the construction shown in the drawing the stress applying member 18 is shown as pivotally mounted in a U-shaped piece 78 at the end of the piston rod, the member 18 being constructed such that the weight of the portion 80 projecting on the opposite side of the pivot normally maintains the sole edge engaging face 20 in position for engagement with the forward edge portions 24 of an outsole 14 during the downward stroke as shown in FIGS. 3 and 4, but enables the member 18 to pivot downward and away from the sole to pass around the sole edge during movement in the opposite direction as shown in FIG. 5.

A stroke counter 82 is mounted on the upright member 66 with its operating arm 84 located to be moved by contact with the U-shaped member 78 as the piston moves upward after completing each stroke.

As shown in FIGS. 2 and 3, downward movement of the stress applying member brings the sole edge engaging face 20 against the forward edge portions 24 of the outsole 14, and distorts it inward and flexes it downward to exert a shearing stress due to the pressure and the compression of the resilient outsole material while applying a downward component of force tending to separate the outsole 14 from the shoe upper 12. The stress applied to the joint 86 between the upper and outsole is greater where the outsole extends a greater distance beyond the toe of the shoe upper; but this greater stress corresponds to the greater stress to which such an outsole would be subjected when struck or kicked against an obstacle while being worn so that the greater stress compensates and matches with the greater stresses encountered in actual use of a shoe having such greater sole edge extension.

The angle of the outsole engaging face 20 to its direction of movement affects the character of stress applied to the outsole 14; and it appears that truest test results are secured where the outsole engaging face 20 is at an angle of from about 15° to about 60° to the direction of movement of the stress applying member 18. The thickness of the stress applying member 18 is designed to be sufficient that the lower edge 88 of the outsole engaging face is displaced away from the outsole 14 by the angle to miss the forward edge 24 of the outsole as shown in FIG. 2. A preferred stress applying member 18 has a dimension of 1½" in the direction of movement of the member 18 with the upper edge 52 of the face 20 projecting ½" over the lower edge 88 of the member and with a lateral width of the face of ⅞". With this arrangement, the first contact between the outsole engaging face 20 and the outsole 14 is between the angularly disposed face 20 and the upper edge of the outsole so that stress is applied progressively, rather than as a hammer blow.

Also in order to insure results useful in predicting the resistance of the outsole to separation, it is important that the speed of the stress applying member 18 not be excessive. Using the tester with a five inch stroke of the stress applying member 18, excellent results have been obtained with the driving mechanism 22 set to provide a speed of the order of 30 cycles per minute. Since the driving mechanism is controlled so that the piston travels at substantially constant speed except at the beginning and end of its stroke, the linear speed of the stress applying

member 18 as it engages the outsole 14 is of the order of five feet per second.

Following the conditions and arrangements above discussed it is found that the stress applied to the outsole 14 in any given stroke is not great enough to tear the outsole from the shoe. However, repeated strokes initiate lines of weakness which result in progressive tearing of cell walls and ultimate separation of the toe portion of the outsole from the shoe upper. Separation of the outsole from the shoe upper is considered to have occurred for purposes of testing when the rupture extends back ⅛" from the initial bond line between outsole and shoe upper.

Resistance to separation of cellular elastomer outsoles from shoe uppers, particularly of molded-on polyurethane outsoles from shoe uppers, under the action of the tester correlates well with resistance to separation in actual wear. It has been found that shoes which will withstand 250 strokes will provide acceptable performance in use and shoes which will withstand 375 or more strokes will provide superior performance.

Having thus described our invention what we claim as new and desire to secure by Letters Patent of the United States is:

1. Tester for determining resistance to separation of a resilient polymeric outsole and a shoe upper at the toe portion of a shoe, said tester comprising means for holding a shoe in a predetermined position and means for flexing edge extension portions of said outsole at the toe portion repeatedly in a direction to create separative stress between said outsole and said shoe upper.

2. A tester for determining resistance to separation of a resilient polymeric outsole and a shoe upper as defined in claim 1 in which said flexing means includes a member having a sole edge extension-engaging face, said member being movable transversely to the lengthwise axis of said shoe along a path in which said face engages said sole edge extension and distorts it out of its path to flex the sole edge extension away from said shoe upper.

3. A tester for determining resistance to separation of polymeric outsole and a shoe upper as defined in claim 2 in which said face is disposed at an angle of from about 15° to about 60° to said path to create a component of force on said sole edge extension toward said shoe and substantially in the direction of the lengthwise axis of said shoe.

4. A tester for determining resistance to separation of polymeric outsole and a shoe upper as defined in claim 3 in which said shoe is held in a position relative to said path in which a forwardmost portion of the toe of said shoe upper is substantially in grazing relation to an edge of said sole edge extension-engaging face moving along said path.

5. A tester for determining resistance to separation of polymeric outsole and a shoe upper as defined in claim 4 in which said sole edge extension-engaging face is mounted on a reciprocating member for engagement with said sole edge extension during movement in one direction to apply separative stress and is displaceable around the sole edge extension during movement in the opposite direction along said path.

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U.S. Cl. X.R.

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