United States Patent [19]

Lock

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[54] **MACHINE FOR TESTING AND STRAIGHTENING ARROWS**

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[52] **U.S. Cl.** **72/34,** 72/386
[51] **Int. Cl.** **B21d 3/16**
[58] **Field of Search** 72/34, 386

[56] **References Cited**

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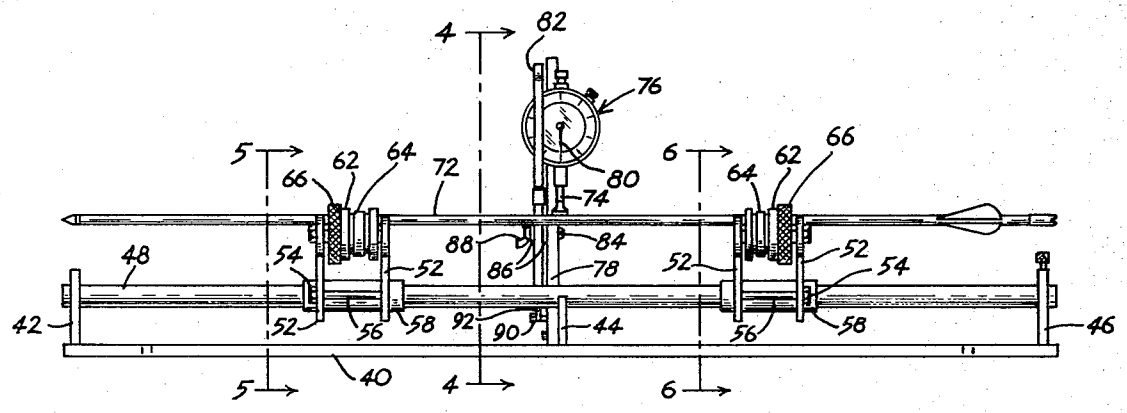
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Primary Examiner—Richard J. Herbst
Attorney, Agent, or Firm—Clarence M. Crews

[57] **ABSTRACT**

A machine is provided for testing the straightness of arrows, for localizing and measuring any want of straightness, and for mechanically correcting any defect of this nature that may be discovered. The machine desirably includes a central stand on which a deflection meter is mounted, together with a straightening lever. A trackway in the form of spaced, parallel horizontal bars is provided. Arrow supporting and rotating carriages are mounted on the trackway with freedom for independent adjustment toward and from the central stand. Each carriage includes two side by side rollers and means for operating the rollers in unison to turn an arrow engaged by the meter and to sustain the arrow during straightening.

6 Claims, 7 Drawing Figures



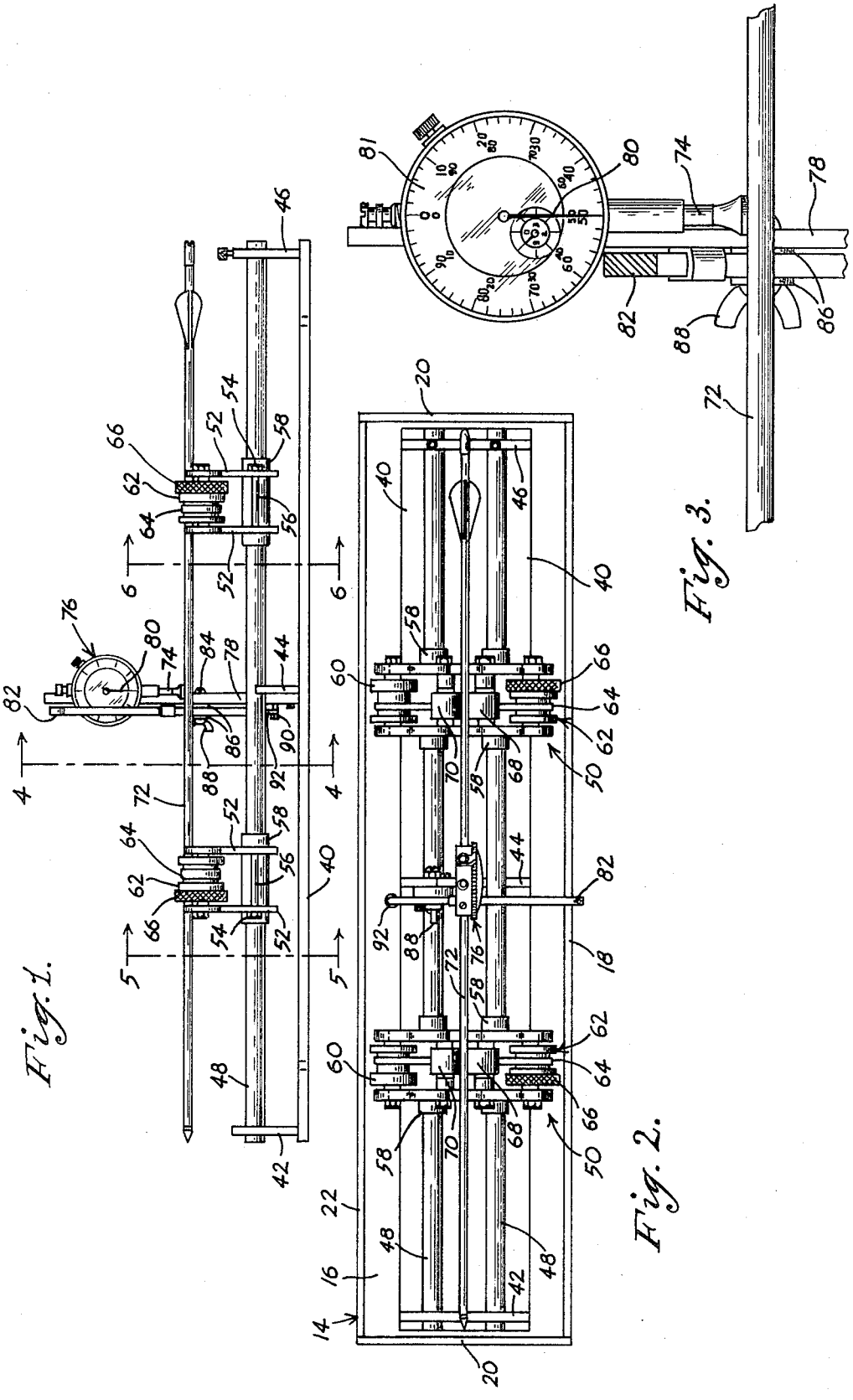


Fig. 1.

Fig. 2.

Fig. 3.

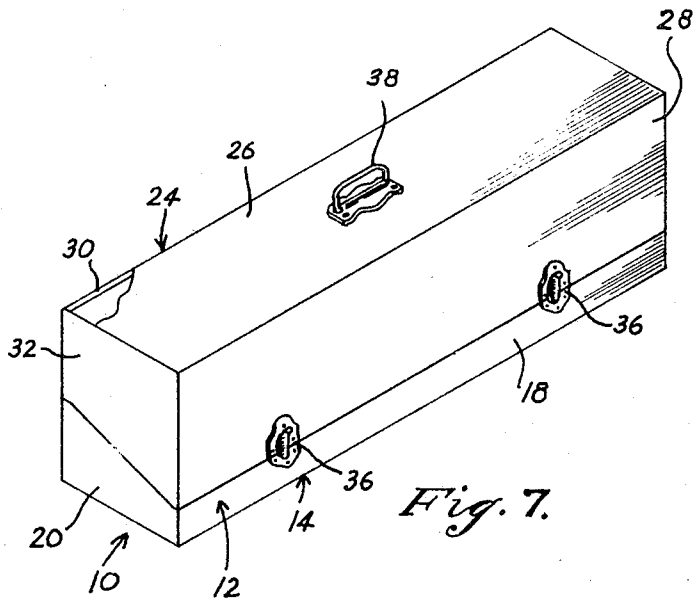


Fig. 7.

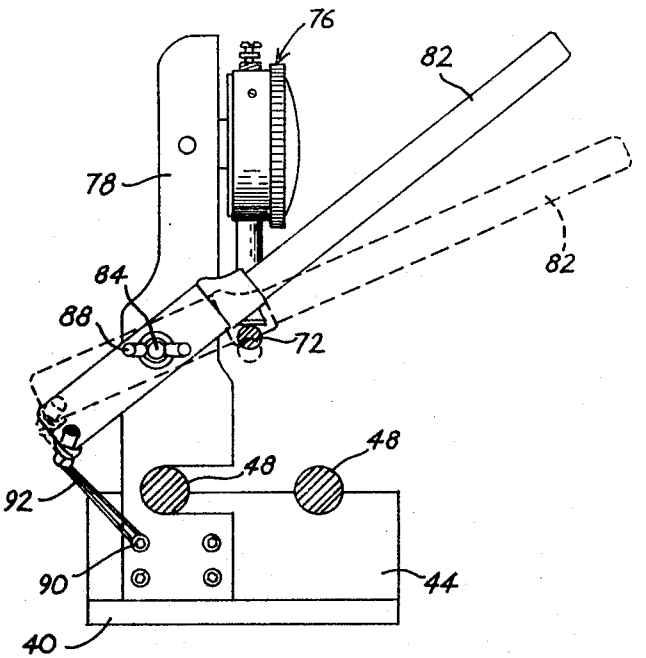


Fig. 4.

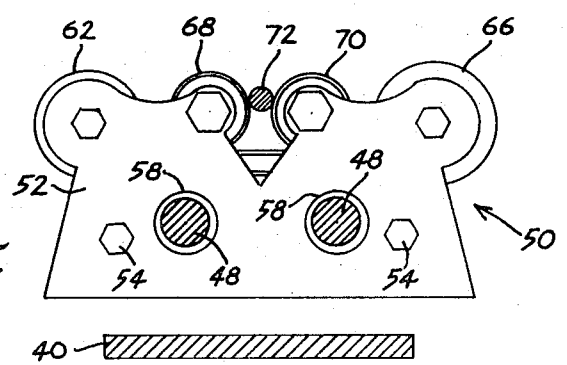


Fig. 5.

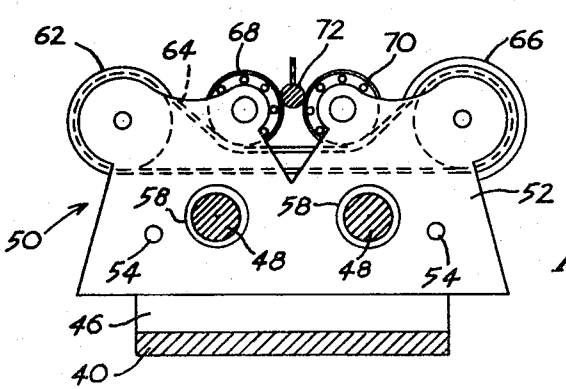


Fig. 6.

MACHINE FOR TESTING AND STRAIGHTENING ARROWS

This invention relates to archery and more particularly to a machine that tests used arrows for straightness, and straightens arrows found to be bent.

In modern archery the shafts of arrows generally take the form of aluminum tubing which is likely to become bent in use. Each arrow shaft is initially straight and is of uniform internal and external diameter, although one set of arrows may differ from another in internal diameter, external diameter, and/or wall thickness. All such arrows are freely bendable within their elastic limits, and any of them can be objectionably deformed if strained beyond its elastic limit. Straightening of a deformed arrow shaft demands deformation beyond its elastic limit. Since the object of archery contests is to test and compare the skill of contestants, it is very important, in the interest of fairness, to make sure that the contestants compete under equal conditions. This means that all arrows used by a contestant, whether previously used or not, must be absolutely straight.

Since used arrows are frequently found to be bent, it is important that each used arrow be tested for straightness and that it be straightened if found to be defective.

It is a primary object of the invention to provide a light, readily transportable, efficient and accurate arrow testing and straightening machine.

Other objects and advantages will hereinafter appear.

In the drawing forming part of this specification,

FIG. **1** is a view in front elevation of the operating parts of my novel machine, with an arrow in position for testing and straightening;

FIG. **2** is a plan view of the structure of FIG. **1** and of the arrow of FIG. **1**, together with an outline of the tray which forms an unitary part of the machine;

FIG. **3** is a fragmentary view in front elevation, on a much larger scale than FIGS. **1** and **2**, showing particularly the operating instrumentalities for testing and indicating straightness or want of straightness of an arrow, and for correcting want of straightness;

FIGS. **4, 5** and **6** are transverse sectional views taken on the lines **4—4, 5—5** and **6—6**, respectively, of FIG. **1**, looking in the direction of the arrows, the views being all on a somewhat larger scale than FIG. **1**; and

FIG. **7** is a perspective view, on a considerably smaller scale than FIG. **1**, showing the carrying case which forms an unitary part of the machine in a closed and latched condition.

My novel machine **10**, as seen in FIG. **7**, includes, as an unitary part thereof, a carrying case **12**. The case **12**, which may be made of plywood or any other suitable sheet material, includes a tray portion **14** which comprises a bottom wall **16**, a low front wall **18**, end walls **20** which increase uniformly in height from front to rear, and a rear wall **22** whose height is desirably one-half of the total height of the case.

As seen in FIG. **7**, the tray **14** is complemented by a cover **24** which includes a top wall **26**, a front wall **28**, a rear wall **30**, and end walls **32**.

The rear walls of the tray and cover, which are desirably of equal height, are connected through hinges **34**. The front walls are equipped with complementary members of latches **36**. The top wall of the cover is equipped with a carrying handle **38**.

The operating mechanism within the case **12** is all supported from a rigid metallic base plate **40**, which plate is affixed to the bottom wall **16** of the tray.

Through fixed, rigid, upstanding plates **42, 44** and **46**, two spaced, parallel, horizontal trackway members, desirably in the form of hollow rigid tubes **48,48**, are fixedly supported.

Identical carriages **50** are slidingly supported on the trackway members **48** at opposite sides of the centrally located plate **44**. Since the carriages are identical a description of one will be equally applicable to the other.

Each carriage **50** includes two vertically disposed parallel plates **52** which are secured to one another by headed machine screws **54** but are spaced at fixed distances from one another by sleeves **56** that are interposed between the plates and surround the shanks of the respective screws **54**. Each carriage desirably includes two bearing sleeves **58** that surround the respective shafts **48** and extend between, through, and well beyond, both plates **52**.

At their upper ends the plates **52** support, between them inner and outer pulleys **60** and **62**, upon which an elastic belt **64**, desirably in the form of a flat rubber band, is trained under tension. The outer pulley includes a knurled wheel **66** through which the belt may be finger-driven.

Inner and outer rollers **68** and **70** are revolubly supported by the plates **52**, being disposed side by side but spaced from one another between the pulleys **60** and **62**. The lower run of the belt **64** is an idle run, but the upper run bears frictionally against the lower sides of rollers **68** and **70**. The rollers **68** and **70**, which always turn in unison, in the direction opposite to that in which the pulleys **62** are operated, serve to support between them an end portion of an arrow **72**. The opposite end of the arrow may be similarly supported by the like structure of the other carriage. By operation of the pulleys **62** in unison the arrow may be turned in either direction desired. There is no exacting requirement as to how nearly in unison the pulleys must be operated. Generally the turning of either one will turn the arrow.

The arrow shaft obviously extends from carriage to carriage through the testing station. At the testing station a spring-urged plunger **74** is caused to bear yieldingly downward, but lightly, against the upper surface of the arrow shaft.

The plunger **74** forms a conventional part of a conventional gauge **76**. The gauge is mounted on a central standard **78**. Through a rack and pinion connection (not shown) an indicator hand **80** is turned relative to a graduated dial **81**. If the arrow is straight the initial reading of the instrument will depend upon the thickness of the arrow shaft, and the reading will be maintained throughout a full revolution of the arrow. Uniformity of reading will indicate that no straightening is required.

If the arrow is not straight a full revolution of the arrow will cause the reading to fluctuate between upper and lower limits. The extent of the sweep between limits will depend upon, and will be proportional to, the deviation of the arrow from a straight condition at the point of testing.

When the limits have been determined, the arrow is turned to produce the top limit reading (convex side of arrow up) and a rigid lever **82,** pivotally mounted on the standard **78** by means of a screw **84,** washers **86,** and a wing nut **88,** is swung down for a distance believed to be sufficient to cause the next test reading to be consistently at the halfway mark—in other words, to straighten the arrow. The arrow may then be tested again in the same way and further correction may be similarly made, if required.

The corrective treatment should desirably be made at the point of greatest deviation. This may be estimated initially by visual inspection if the defect is a pronounced one. Otherwise it may be determined by testing the arrow at various points along the length of its shaft before taking any corrective action. Similar tests and similar correction may be made at different points lengthwise of the shaft until the arrow is found to be straight.

The rear arm of the lever **82** is connected to a projection **90** on the lower portion of the standard **78** through an elastic member, illustratively a rubber band **92,** so that the forward, arrow-bending arm of the lever is automatically maintained in an out-of-the-way, upper-limit-of-movement position when not in active use.

If, as in the illustrative case, the lever **82** is too long to be housed in the case **12,** in its normal position, it can be readily detached along with the rubber band **92** for separate storage in the case **12.** Removal and replacement of the lever can be very quickly effected.

The need for removing the lever can, of course, be obviated by shortening the lever or by enlarging the case, but the relationships illustrated have been found most practical.

I have described what I believe to be the best embodiment of my invention. What I desire to cover by letters patent, however, is set forth in the appended claims.

I claim:

1. An arrow testing and straightening machine for testing straightness and directly, manually correcting deviations from straightness of arrow shafts composed of freely bendable, metallic tubing, comprising, in combination,

a. a stand located at a central deflection detecting and straightening station;

b. a fixed, straight, horizontal trackway constructed and arranged to extend at opposite sides of the deflection detecting and straightening station;

c. a pair of cooperative arrow supporting carriages mounted on said trackway at opposite sides of said station with freedom for individual adjustment along the trackway toward and from said central station, each of said carriages including a pair of side by side rollers adapted jointly to support an arrow shaft segment between them, and means constructed and arranged to operate the rollers of each carriage in unison for turning a roller supported arrow;

d. a sensitive, deflection detecting, magnifying and indicating instrument of the dial type mounted on the stand and comprising a plunger, spring pressed downward to bear downward against the upper side of the arrow shaft being tested, and

e. a manually operable deflection correcting means at said station, engageable with the upper side of the carriage-bridging arrow shaft, and movable freely in a downward direction to deform the arrow shaft beyond its elastic limit, the space beneath the carriage-bridging arrow shaft being free of obstruction so that the arrow shaft can be freely deformed to any extent dictated by the judgment of the operator.

2. An arrow testing and straightening machine as set forth in claim **1** in which the deflection detecting and indicating means comprises a spring loaded plunger, a graduated dial, a rotary indicating pointer associated with said dial, and means for rotatively operating the indicating pointer from the plunger.

3. An arrow testing and straightening machine as set forth in claim **1** in which each carriage includes a manually operable belt-driving wheel at the front of the carriage, a cooperative belt-supporting wheel at the rear of the carriage, a belt trained on said front and rear wheels, and a pair of intermediate, arrow-supporting wheels engaged and driven in unison by the upper reach of the belt.

4. An arrow testing and straightening machine as set forth in claim **3** in which the belt has the form of a tensed elastic band.

5. An arrow testing and straightening machine as set forth in claim **1** in which the manually operable, deflection correcting means includes a rigid lever, means on the stand supporting the lever for rocking movement in a vertical plane, and elastic means connecting a first or inactive arm of the lever to the stand under tension and thereby biasing a second or active arm of the lever to a normal, idle position above the level normally occupied by an arrow which is jointly supported by the carriages.

6. An arrow testing and straightening machine as set forth in claim **1** in which a rigid supporting frame is provided for the trackway and the central stand, and a carrying case is attached to the frame and thereby made an unitary and permanent part of the machine, said carrying case being of right prismatic form and comprising body and cover portions having hingedly connected rear walls of equal height, and complementary end walls of variable height with the back wall of the body exceeding in height the front wall of the body by a substantial amount and with the front wall of the cover exceeding in height the back wall of the cover by substantially the same amount, the construction and arrangement being such that the full height of the carrying case is adequate to contain the complete machine, but the restricted height of the front wall of the tray makes fully and freely accessible the means for operating the arrow shaft turning rollers.

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