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ARROW RETURN AND QUIVER LOADING MECHANISM

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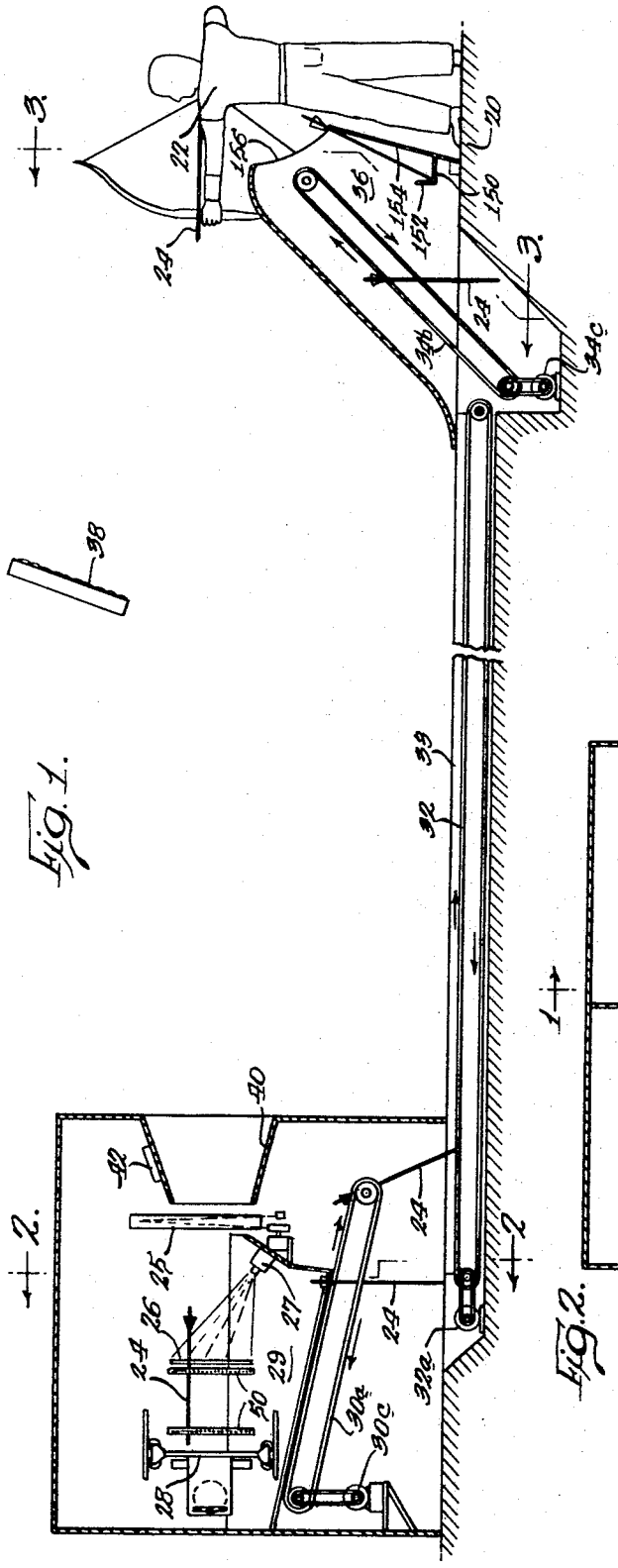


Fig. 1.

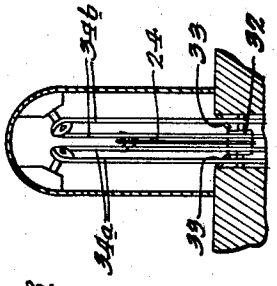


Fig. 3.

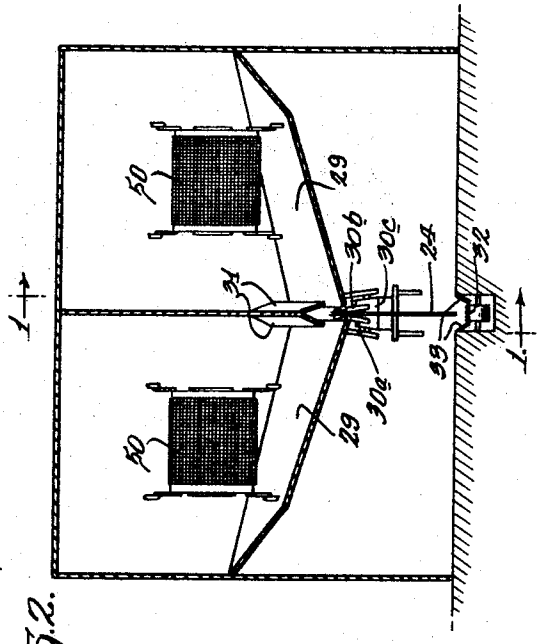


Fig. 2.

Inventor
Goodrich B. Pratt
By
Hofgren, Wegner,
Allen, Stellman & McCord
Attys

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ARROW RETURN AND QUIVER LOADING MECHANISM

Goodrich B. Pratt, Grand Haven, Mich., assignor to Brunswick Corporation, a corporation of Delaware

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This invention relates to archery.

The object of the invention, in general terms, is to provide a new and improved arrow return and quiver loading mechanism for an archery range.

More specifically, it is an object of the invention to provide means for returning fired arrows to a quiver adjacent the archer so as to eliminate delays incurred in retrieving fired arrows, while miniminzing both the possibility of damage to the arrows while they are in transit and the number of arrows required by the archer.

Another object of the invention is the provision of means for returning fired arrows to a quiver adjacent the archer so as to eliminate delays incurred in retrieving fired arrows including conveyor means for delicately handling the arrows by the fletching wherein the contact pressure is applied generally in a direction opposite to their normal course of flight so that the contact between the fletching and the surrounding surfaces is in a direction running with the grain of the fletching to preclude damage thereto.

Another object of the invention is the provision of an arrow return and quiver loading mechanism including spaced arrow supporting surfaces for supporting arrows by the fletching and conveying them in a predetermined orientation to means for returning the arrows to a point adjacent a firing line, and means adjacent the firing line for receiving such arrows including second spaced arrow supporting surfaces for ejecting the arrows into a quiver where the arrows are held in readiness for an archer.

Another object of the invention is the provision of an arrow return and quiver loading mechanism including a collector member adapted to underlie an archery target and backstop, a first pair of narrowly spaced conveyor belts disposed to receive arrows from the collector member, conveyor means for receiving arrows from the first pair of narrowly spaced belts and for conveying the arrows to a remote point, and a second pair of narrowly spaced conveyor belts at the remote point for receiving arrows from the conveyor means and for conveying arrows to a subjacent quiver and ejecting the arrows pointed end first into the quiver.

Another object of the invention is the provision of such an arrow return and quiver loading mechanism wherein the spacing between the upper runs of the pairs of belts is such as to support arrows by the fletching, and the spacing between the lower runs of the pairs of belts is such as to preclude arrow damaging interference between the lower runs and arrows supported by the upper runs of the pairs of belts.

Other objects of the invention will become readily apparent from the following detailed description taken in connection with the drawings wherein:

FIG. 1 is a longitudinal section through a preferred form of the invention, approximately along the line 1—1 of FIG. 2;

FIG. 2 is a transverse section of FIG. 1 taken approximately along the line 2—2; and

FIG. 3 is another transverse section of FIG. 1 taken approximately along the line 3—3.

An archery range in which an arrow return and quiver loading mechanism according to the invention may be used, although not limited thereto, is shown in FIGS. 1–3 and is described in detail in the copending application

Ser. No. 432,787, filed Feb. 15, 1965, and assigned to the same assignee as the instant application, the disclosure of which is herein incorporated by reference.

The range includes a shooting station or firing line **20** remotely located from a target **26**. An archer **22** may occupy the shooting station **20** and fire arrows **24** at the target **26**. Scanning means **25** are provided adjacent the target **26** for scanning the flight path of an arrow **24** fired at the target **26** to determine the point at which the arrow **24** hit the target **26**.

A target monitor **38** is placed near the shooting station **20** and includes means responsive to the scanning means **25** for indicating to the archer **22**, and such spectators as may be present, the point on the target **26** hit by the arrow **24**. Additionally, a backstop **28**, preferably of the self-ejecting type disclosed in the above cited copending application, is placed behind the target **26** and is arranged to stop arrows passing through the target **26**.

An inclined collector plate **29** (see FIGS. 1 and 2) underlies the target **26** and backstop **28** and receives arrows discharged by the latter. A first pair of narrowly spaced belts **30***a*, **30***b* (see FIGS. 1 and 2) are mounted for movement within their upper runs adjacent the lower edge of the collector **29**. The spacing between the upper runs of the belts **30***a*, **30***b* is sufficiently wide such that the shaft of an arrow will pass therebetween but sufficiently narrow such that the arrow fletching will not pass between the upper runs. Additionally, the lower ends of the belts **30***a*, **30***b* are horizontally displaced away from the space between the upper runs such that the spacing between the lower runs is significantly greater than the space between the upper runs. This arrangement is extremely desirable for reasons that will be seen hereafter. The belts **30***a*, **30***b* are driven in the same direction and at the same speed by a motor and transmission arrangement, shown generally at **30***c*, of suitable construction. Deflectors **31** (see FIG. 2) are arranged along the lower edge of the collectors **29** and the upper runs of the belts **30***a*, **30***b* and are spaced upwardly therefrom such that an arrow must be substantially in contact along its entire length with the collectors **29** to pass to the belts **30***a*, **30***b*.

Once on the collectors **29**, the arrows slide or roll down the incline to the lower edge thereof. The deflectors **31** orient the rolling or sliding arrows such that they are parallel to the upper runs of the belts **30***a*, **30***b*. The arrows continue to slide or roll until they contact and rest upon the upper runs of the belts **30***a*. **30***b*. At this point, the shaft of the arrow drops between the belts **30***a*, **30***b* resulting in the arrow being suspended substantially vertically with its fletching resting on the upper runs of the belts **30***a*, **30***b*. Since the lower runs of the belts **30***a*, **30***b*, which are moving in an opposite direction from the upper runs, are outwardly displaced from the upper runs, there is no interference between the arrows and the lower runs that would result in injury to the arrows.

Below the end of the run of the belts **30***a*, **30***b* is a conveyor **32** of the belt type which returns ejected arrows to the shooting station or firing line **20**. Preferably the conveyor **32** is operated by a suitable motor and transmission **32***a* at a higher speed than the belts **30***a*, **30***b* such that an arrow hanging vertically from the belts **30***a* **30***b* will engage the conveyor **32** with its point which will then be drawn forwardly of the fletching as seen in FIG. 1. When the belts **30***a*, **30***b* discharge the fletched end of the arrow, it will fall on the conveyor **32** behind the point of the arrow. Thus the arrow will be moved in a direction similar to its normal flight whereby the fletching will not be damaged by moving contact with the walls surrounding the conveyor **32**. Reflectors **33** (see FIG. 2) are placed on either side of the conveyor **32** to maintain proper alignment of the arrow on the conveyor **32**.

Below the end of the run of the conveyor **32** as seen in FIGS. 2 and 3 is a lowermost end of the run of an inclined pair of narrowly spaced belts **34***a*, **34***b* which are driven in the same upwardly direction and at the same speed by a motor and transmission **34***c*. With the exception of the upward inclination of the belts **34***a*, **34***b*, the relationship of upper and lower run spacing and displacement is substantially identical to that between belts **30***a*, **30***b*, and accordingly, further description is believed unnecessary. When the belts **34***a*, **34***b* are in operation, an arrow being carried by the conveyor **32**, because of the alignment function of deflectors **33**, will be projected between the belts **34***a*, **34***b* until its fletching comes in contact with the upper runs of the belts **34***a*, **34***b*. The belts **34***a*, **34***b* will then carry the arrow by its fletching and in a substantially vertical position forwardly and upwardly to the upper end of the run of the belts **34***a*, **34***b*. The arrow is then dropped pointed end first from the belts **34***a*, **34***b* into a quiver generally designated **36** placed adjacent the firing line **20**.

The quiver **36** (see FIG. 1) comprises a bottom wall **150** placed a distance greater than the length of an arrow directly below the upper end of the inclined belts **34***a*, **34***b* and having an upwardly projecting retaining flange **152**. Partially surrounding the bottom **150** is a wall **154** which is inclined toward the archer and has an access opening **156** at its upper edge. The combination of the inclined belts **34***a*, **34***b* and the quiver **36** is arranged to preclude arrows dropping from the belts **34***a*, **34***b* to the quiver **36** from falling backwardly over the upwardly projecting retaining flange **152** into the return mechanism and fouling the latter. Because of the motion of the arrow imparted in the direction of the inclined wall **154** by the inclined belts **34***a*, **34***b*, the inertia of the arrow will cause it to hit the inclined wall **154** where it will come to rest. Thus, when arrows **24** are delivered upwardly by the belts **34***a*, **34***b* they fall therefrom and strike the bottom **150** of the quiver and come to rest leaning against the bottom **150**, the retaining flange **152** and the wall **154** in close proximity to the access opening **156**, whereby the archer may simply pick up additional arrows **24** as he requires them.

Having disclosed a specific embodiment of my invention, I do not intend that my invention be limited to the specific construction set forth, but rather construed broadly according to the true spirit thereof as set forth in the following claims.

I claim:

1. An arrow return and quiver loading mechanism comprising: an inclined member adapted to underlie an archery target and backstop for collecting arrows, a first pair of conveyor belts trained along a lower edge of said member, said first belts having parallel portions spaced apart a distance less than the distance between the outermost extremities of the fletching of an arrow whereby an arrow will hang substantially vertically between said first belts suspended by its fletching, conveyor means below the end of the run of said belts for receiving arrows dropped therefrom and conveying them to a remote point, a second pair of conveyor belts disposed in an inclined plane and extending from below said remote point to a location above said conveyor means, said second belts having parallel portions spaced apart a distance less than the distance between the outermost extremities of the fletching of an arrow whereby said arrow will hang substantially vertically between said second belts suspended by its fletching, and a quiver for receiving arrows from said second belts comprising a bottom with a upwardly directed retaining flange, a wall partially surrounding said bottom and having an access opening therein, said bottom being disposed below said location a distance greater than the length of an arrow, whereby arrows from said second belts will drop therefrom and come to rest against said bottom, said returning flange and said wall in close proximity to said access opening.

2. The arrow return and quiver loading mechanism of claim **1** wherein said parallel portions of said first and second pairs of belts comprise the upper runs of said belts and wherein the lower runs of said first and second pairs of belts are spaced apart a distance greater than the spacing between said parallel portions, whereby an arrow suspended from said parallel portions will not engage said lower runs and be damaged by contact therewith.

3. The arrow return and quiver loading mechanism of claim **1** wherein said conveyor means includes means for driving said conveyor means at a speed greater than that of said first belts whereby an arrow will always be carried by said conveyor means with its pointed end forwardly of its fletched end to preclude damage thereto.

4. An arrow return and quiver loading mechanism comprising: arrow collecting means for collecting spent arrows, means adjacent said collecting means for delivering arrows in a substantially vertical position to a conveying means, said conveying means being operable to deliver arrows to a remote point, means at said remote point for receiving arrows from said conveying means and delivering arrows in a substantially vertical position with the fletched end uppermost to a quiver means, said quiver means being arranged to hold arrows in readiness for an archer.

5. An arrow return and quiver loading mechanism comprising: a collector adapted to underlie a backstop for receiving spent arrows therefrom, first conveyor means adjacent said collector having two arrow supporting surfaces for supporting arrows received from said collector by the fletching and conveying arrows in a predetermined orientation to a second conveyor means, said second conveyor means including means for delivering arrows received from said first conveying means to a remote point, quiver means adjacent said remote point for receiving and holding arrows, and third conveyor means interposed between said remote point and said quiver and having two arrow supporting surfaces for (1) receiving arrows from said second conveyor means at said remote point, (2) supporting the arrows by the fletching and conveying them to said quiver and (3) ejecting the arrows pointed end first into said quiver, whereby the arrows will not be damaged during the return thereof to the quiver.

6. The arrow return and quiver loading mechanism of claim **5** wherein said two arrow supporting surfaces are spaced apart a distance less than the distance between the outermost extremities of the fletching of an arrow.

7. The arrow return and quiver loading mechanism of claim **6** wherein said two arrow supporting surfaces comprise a pair of belts.

8. An arrow return and quiver loading mechanism comprising: conveying means for conducting spent arrows along a range toward a firing line, means for collecting spent arrows adjacent a target and delivering the same to the conveying means, quiver means adjacent the firing line for holding arrows vertically disposed in readiness for an archer and means for receiving arrows from said conveying means and delivering all arrows thus received substantially vertically disposed with the fletched end uppermost from said conveying means to said quiver means.

9. An arrow return and quiver loading mechanism comprising: conveying means for conducting spent arrows toward a firing line on an archery range, a pair of conveyor belts disposed in an inclined plane and extending from a point below the conveying means to a location above the conveying means, said belts having parallel portions spaced apart a distance less than the distance between the outermost extremities of the fletching of an arrow whereby an arrow will hang substantially vertically between said belts suspended by its fletching engaging said belts, and a quiver for receiving arrows from said belts comprising: a bottom with an upwardly extending

retaining flange, a wall partially surrounding said bottom and having an upper access opening therein for arrow removal, said bottom being disposed below said location a distance greater than the length of an arrow whereby arrows from said belts are dropped therefrom and come to rest in an upright position with the lower end on said bottom and retained by said flange and the upper end leaning against said wall.

10. An arrow return and quiver loading mechanism according to claim **9** wherein said conveying means comprises a conveyor and arrow collecting means for collecting spent arrows and delivering the arrows to said conveyor.

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RICHARD C. PINKHAM, *Primary Examiner.*

M. R. PAGE, *Assistant Examiner.*