Sept. 14, 1965 D. T. ARMINGTON 3,206,167

STRAP TENSIONER DEVICE WITH FULCRUM MEANS FOR PIVOTAL REMOVAL OF THE DEVICE

Filed Nov. 7, 1963 2 Sheets-Sheet 1

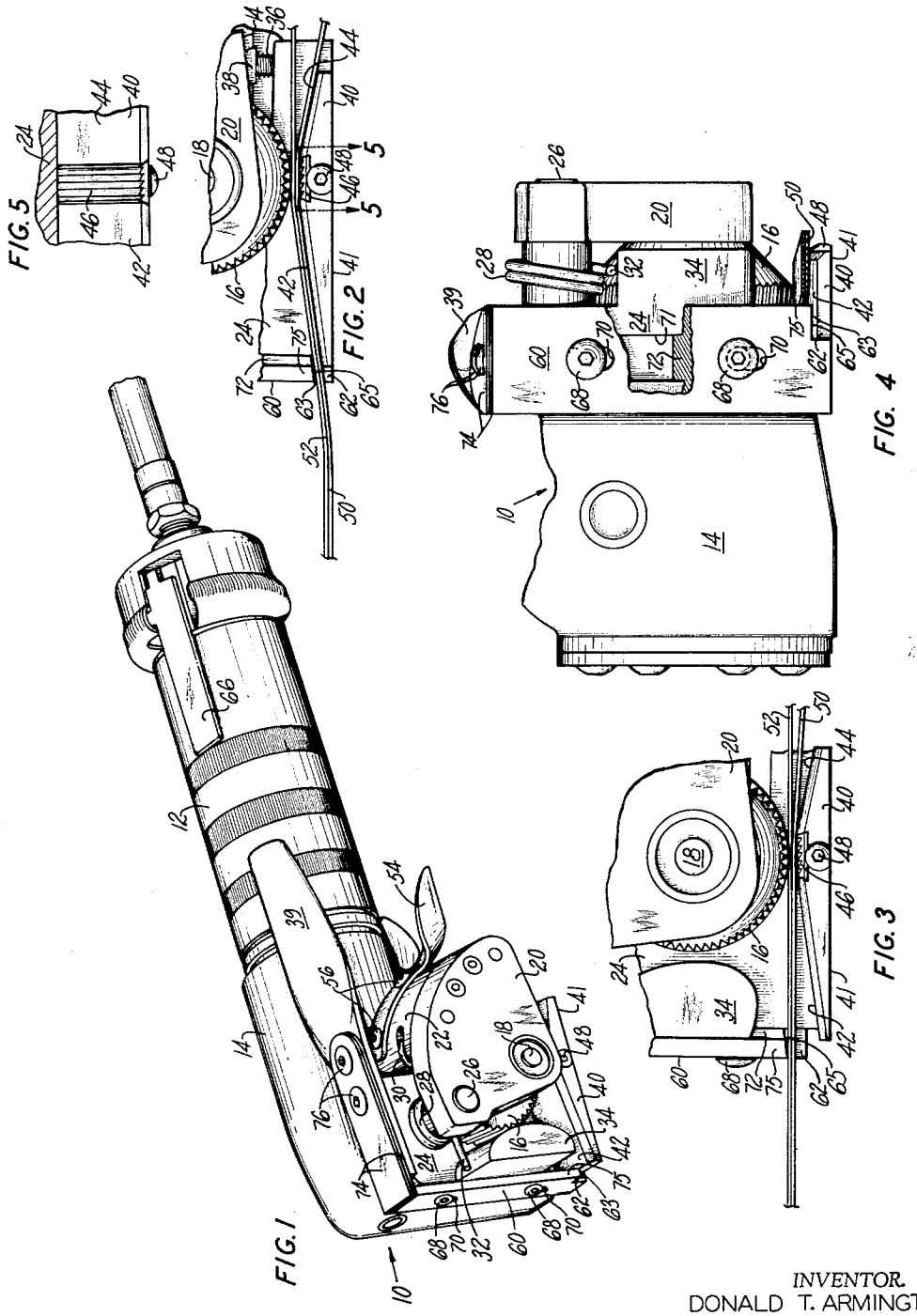


FIG. 1

FIG. 2

FIG. 3

FIG. 4

FIG. 5

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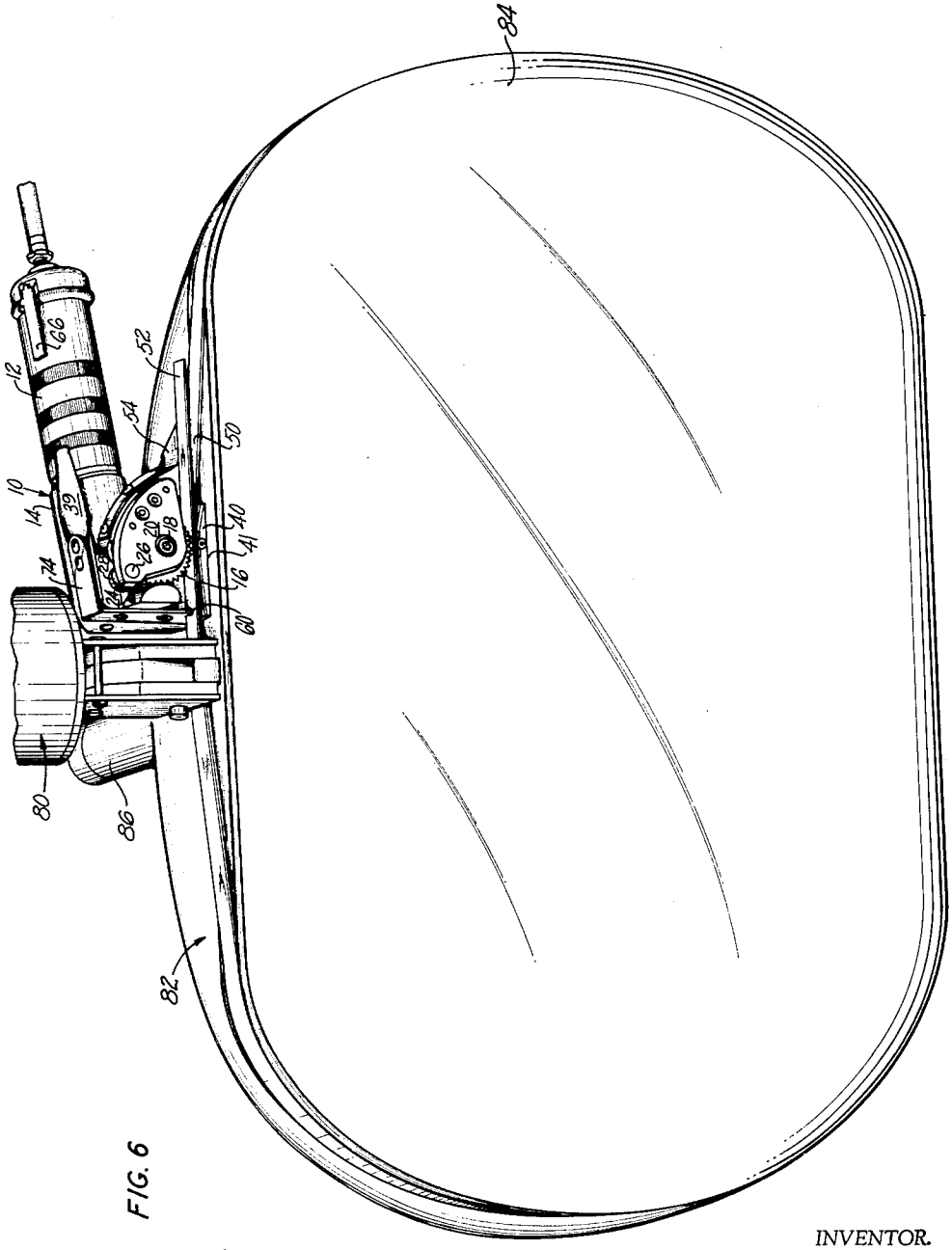


FIG. 6

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United States Patent Office 3,206,167 Patented Sept. 14, 1965

3,206,167

STRAP TENSIONER DEVICE WITH FULCRUM MEANS FOR PIVOTAL REMOVAL OF THE DEVICE

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Filed Nov. 7, 1963, Ser. No. 322,166
4 Claims. (Cl. 254—51)

The present invention relates to strap tensioners of the type useful in conjunction with a strap sealer for applying a tensioned strap to an article or package and more specifically to a strap tensioner having particular utility for tensioning a strap about a substantially noncompressible, irregular, or fragile article, such as a conventional TV picture tube. When the article to be strapped is noncompressible, irregular or fragile it may be desirable, in order to provide the optimum residual tension in the sealed strap, to draw the strap taut about the article with the strap tensioner, to seal the tensioned loop of strap, and to remove the strap tensioner from the sealed loop of tensioned strap, all without substantially overstressing the strap above the desired residual tension and without placing an undue force upon the article. The present invention is accordingly directed to a new and improved strap tensioner which allows for applying a tensioned loop of strap to an article with minimum overstressing of the strap and which includes a fulcrum device for pivotal removal of the strap tensioner from the sealed loop of strap without overstressing the strap or applying undue force on the article.

It is a primary aim of the present invention to provide a new and improved strap tensioner which can be readily removed after a strap has been tensioned and sealed about an article even though the article is fragile or substantially noncompressible. Included in this aim is the provision of an improved strap tensioner of the type having a base positioned between the strap and the article while the strap is being applied to the article which can be readily withdrawn from beneath the tensioned and sealed strap without further stressing the strap or applying additional pressure to the article.

It is another object of the present invention to provide a strap tensioner which can be manually manipulated for tensioning a strap and which can be conveniently manually withdrawn from the tensioned strap after it has been sealed to the article.

Other objects will be in part obvious and in part pointed out more in detail hereinafter.

The invention accordingly consists in the features of construction, combination of elements and arrangement of parts which will be exemplified in the construction hereafter set forth, and the scope of the application of which will be indicated in the appended claims.

In the drawings:

FIG. 1 is a perspective view, partly broken away, of an embodiment of a strap tensioner of the present invention;

FIG. 2 is an enlarged partial side view, partly broken away, of the strap tensioner showing overlapping portions of an untensioned strap inserted therein;

FIG. 3 is an enlarged partial side view similar to FIG. 2 showing the overlapping portions of strap in a tensioned configuration;

FIG. 4 is a front view, partly broken away and partly in section, of the strap tensioner showing it at an intermediate stage of removal from a tensioned strap;

FIG. 5 is a partial section view taken substantially along line 5—5 of FIG. 2; and

FIG. 6 is a perspective view of an installation of the

strap tensioner and a strap sealer for application of a strap about a conventional TV picture tube.

Referring now to the drawings in more particularity, a preferred embodiment of a strap tensioner of the present invention, generally denoted by the numeral **10**, comprises a conventional rotary air motor **12** suitably secured to a housing **14** which, in a well-known manner, encases a speed reducer for drivingly connecting the air motor **12** with a serrated friction wheel **16** to rotatably drive the wheel counterclockwise as viewed in FIG. 3. The friction wheel **16** has a drive shaft (not shown) rotatably mounted in a bearing **18** in a side plate **20** which is fixed to an integral lateral extension **22** of the housing **14**.

A pivot plate **24** is piovtally connected to the housing **14** between the side plate **20** and housing **14** by a fixed pivot pin **26** extending therebetween, for which purpose the pivot plate is provided with an arcuate slot (not shown) receiving the friction wheel shaft. The pivot plate **24** is pivotally biased, counterclockwise as viewed in FIG. 3, by a torsion spring **28** which encircles the pivot pin **26** and which has elongated legs **30**, **32** in engagement with the lateral housing extension **22** and with a lug **34**, respectively, which lug **34** is integrally formed with the pivot plate **24**. For limiting the pivotal movement of the plate **24** under the bias of the torsion spring **28** an adjustable stop **36** (FIG. 2) is threaded into the plate **24** for engagement with a hardened element **38** fixed to the housing **14**. For pivoting the plate against the bias of torsion spring **28**, clockwise as seen in FIG. 2, there is provided a rearwardly extending handle **39** fixed to the plate **24** which can be conveniently manually actuated while manipulating the tensioner.

In accordance with the present invention, the pivot plate **24** is provided with an integral elongated narrow base **40** located adjacent to and beneath the friction wheel **16**. The base **40** has a generally planar base surface **41** adapted for engagement with the article to which a strap is being applied. The outer surface of the base **40** is longitudinally tapered from adjacent the friction wheel **16** to provide a forward ramp **42** and a rear ramp **44** which extend generally parallel to the axis of rotation of the friction wheel. Intermediate the forward and rear ramps and fixed in a lateral groove in the base is a hardened insert **46** which can be conveniently removed from the base by removing a retaining screw **48**. The insert **46** is positioned for cooperation with the friction wheel **16** for retaining the inner lap of strap **50** against longitudinal slippage on the base while the tension wheel is advancing the outer lap of strap **52**, to the right as seen in FIGS. 2, 3 and 6, for which purpose, the insert **46** is provided with forwardly facing lateral serrations extending substantially parallel to the axis of the friction wheel **16**, and the friction wheel **16** is provided with similar rearwardly facing serrations which, however, are inclined to the wheel axis, clockwise as seen in FIGS. 2 and 3, whereby as a result the overlapping portions of the strap are urged inwardly against the pivot plate **24** for maintaining them in proper relationship with the tension wheel during the tensioning operation. Accordingly, the pivot plate **24** provides for longitudinally guiding the laps of strap with respect to the strap tensioner, which guidance is assisted by a rear strap guide **54** formed from sheet metal and secured to the housing extension **22** as by fasteners **56**. The axis of rotation of the friction wheel **16** and the axis of pivotal movement of the pivot plate **24** are related so that the frictional force between the inner and outer laps of strap assists the torsion spring **28** in clamping the laps and thereby increase the effectiveness of the serrated surfaces of the tension wheel **16** and insert **46**.

In accordance with a principal aspect of the present invention, a forward fulcrum plate **60** is mounted for recip-

rocable movement on the pivot plate **24** substantially normal to the planar base surface **41** by a pair of fasteners **68** and by a channel guideway **71** in the pivot plate **24** which receives a cooperating projection **72** of the plate **60**. The fasteners **68** are received within elongated slots **70** in the fulcrum plate and thereby provide for limiting the reciprocable movement of the plate. The fulcrum plate is urged inwardly to its lower limit or extended position shown in FIG. 4 by a pair of leaf springs **74** having their forward ends overlapping the upper edge of the plate and their rear ends fixed to the handle **39** by fasteners **76**. A lower lateral corner of the fulcrum plate is cut out at **62** to define with the forward ramp **42** a lateral slot opening **63** adapted for receiving the untensioned overlapping portions of the strap, as shown in FIG. 2. The fulcrum plate therefore has a generally L-shaped edge portion with a laterally extending edge **65** overlying a strap received in the opening **63** and an edge **75** extending outwardly therefrom. Accordingly, when positioning the strap about an article for tensioning, the overlapping portions of the strap are inserted within the slot opening **63** and between the friction wheel **16** and insert **46** for which purpose the pivot plate **24** may be pivoted against the bias of the torsion spring **28** by the handle **39**. The strap tensioner can thereafter be manually operated by a suitable motor control **66**.

For the application of a strap about an associated article the strap tensioner is operated for tensioning the strap and a conventional strap sealer is used to seal the overlapping portions of strap preferably at a point forwardly of the strap tensioner. This tensioning and sealing of the strap operates to displace the strap outwardly from the associated article and thereby separate the strap from the front and rear ramps of the base **40** with the result that the fulcrum plate **60** is raised or retracted against the bias of the leaf springs **74** as shown in FIG. 3. In this regard, the strap is displaced from the associated article principally as a result of the camming effect of the sealer jaws against the underside of the strap as they move inwardly beneath the strap for sealing.

The strap tensioner can then be manually moved to displace the base **40** from between the sealed loop of tensioned strap and the article preferably after the strap sealer is operated to withdraw the sealer jaws from beneath the strap and the sealed loop of strap is suitably sheared from the unused strap. This is accomplished by laterally pivoting the tensioner clockwise, as viewed from thereabove, to displace the lateral edge **65** of the fulcrum plate **60** out of overlying association with the sealed strap and thereby allow the leaf springs **74** to move the fulcrum plate inwardly to its lower limit, at which point the edge **75** of the fulcrum plate is disposed adjacent the lateral edge of the tensioned loop of strap as shown in FIG. 4. The strap tensioner can then be pivoted counterclockwise, as viewed from thereabove, whereby the edge **75** of the fulcrum plate **60** engages the strap edge to provide a fulcrum for displacing the base laterally from beneath the tensioned strap. Accordingly, the strap tensioner can be readily removed after the strap is tensioned and sealed without the necessity of lifting the tensioner from the article and therefore without further stressing the straps or affecting the residual tension thereof, and inasmuch as the serrations on the insert **46** extend laterally on the base and the strap is out of contact with the tampered ramps **42, 44**, the lateral displacement of the tensioner from the tensioned strap is facilitated.

Referring now to FIG. 6 wherein there is shown an installation of a tensioner **10** of the present invention and a sealer **80**, which may be of any well-known variety, for use in connection with the application of a tensioned strap to a conventional TV picture tube **82**. This application of a tensioned strap has been found to be useful in preventing implosion of the tube as when the face **84** of the tube is cracked or broken. Such tubes are conventionally highly vacuumized and accordingly when the tube is cracked or broken, the implosion of the tube typically results in the rearward portion **86** of the tube being drawn forwardly through the tube face with a hazardous situation resulting. It has been found, however, that by the application of a tensioned loop of strap about the tube perimeter adjacent the tube face implosion of the tube and the dangerous consequences that may result therefrom can be minimized. This result is obtained because the tensioned strap compresses the tube slightly to sufficiently force the face of the tube outwardly and the rearward portion **86** of the tube rearwardly thereby offsetting the forces released when the tube is broken. However, the tube compression and therefore the strap tension must be maintained within certain limits to be effective and yet to avoid damaging the picture tube. Accordingly, the tension applied to the strap by the tensioner must be substantially reduced after the tensioner is removed from the tube and such removal of the tensioner must be accomplished without increasing the strap tension or without bearing against the tube.

The utility and advantages of the strap tensioner of the present invention in the application of a tensioned strap to a TV picture tube should therefore be readily appreciated. The tensioner can be readily operated to tension the strap about the tube and the sealer **80** can be operated in a well-known manner to seal the tensioned strap. Thereafter, the tensioner **10** can be readily removed merely by laterally pivoting the tensioner first clockwise and then counterclockwise during which latter pivotal movement the plate **60** provides a fulcrum for pivotal movement of the tensioner base **40** from beneath the tensioned strap. Moreover, as the tensioner base **40** is narrow and is merely withdrawn laterally from beneath the tensioned strap, its removal will not substantially affect the resulting residual tension of the strap.

Thus, it can be seen that the strap tensioner of the present invention provides a readily useful and convenient tool for applying a strap to a fragile or noncompressible article, as for example a TV picture tube, and which can be readily removed from the tensioned and sealed strap without thereby overtensioning the strap or forcing the base of the tensioner against the strapped article.

As will be apparent to persons skilled in the art, various modifications and adaptations of the structure above described will become readily apparent without departure from the spirit and scope of the invention, the scope of which is defined in the appended claims.

I claim:

1. In a tool for tensioning a strap about an article having, a base with a base surface engageable with the article and an outer surface portion for receiving a longtudinally extending strap, and a driven tensioning member mounted for operative engagement with the strap for forwardly feeding the strap longitudinally across the outer surface portion, the improvement wherein the tool further comprises a fulcrum member longitudinally spaced from the tensioning member rearwardly thereof having a generally L-shaped edge portion with a first laterally extending substantially straight edge part in longitudinal alignment with the outer surface portion of the base, said first edge part being positioned in overlying relationship with the strap for engagement with the outer surface thereof as the strap is tensioned by the driven tensioning member, and a second substantially straight edge part extending outwardly from a lateral end of the first edge part engageable with a lateral edge of the tension strap after the tool and has been laterally pivoted in one pivotal direction for displacing the first edge part out of said overlying relationship with the strap whereby the second edge part provides a fulcrum for the pivotal movement of the tool in the opposite pivotal direction for removal of the base from between the tensioned strap and article.

2. The improvement of claim **1** further comprising means for mounting the fulcrum member on the base for rectilinear movement in a direction outwardly of the strap,

said fulcrum member being positioned so that when the strap is tensioned the strap withdraws the fulcrum member outwardly of the base, and so that when the tool is laterally pivoted for positioning the first edge part out of said overlying relationship with the strap, the fulcrum member can be extended for engagement of the second edge part of the fulcrum member with the strap to provide a fulcrum for pivotal movement of the tool in said opposite pivotal direction.

3. In a tool for tensioning a strap about an article having, a base with a base surface engageable with the article and an outer surface portion for receiving a longitudinally extending strap, and a driven tensioning member mounted for operative engagement with the strap for forwardly feeding the strap longitudinally across the outer surface portion, the improvement wherein the tool further comprises a fulcrum member mounted for reciprocable rectilinear movement generally normal to the base surface, said fulcrum member having an L-shaped edge portion with a laterally extending first substantially straight edge part longitudinally spaced from the driven tensioning member rearwardly thereof and positioned in overlying relationship with the strap for engagement with the outer surface thereof, and a second substantially straight edge part extending outwardly from a lateral end of the first straight edge part providing a fulcrum edge for pivotal removal of the tensioning tool.

4. In a tool for tensioning a strap about an article having, a longitudinally extending base with a base surface engagable with the article and an outer surface for receiving longitudinally extending overlapping strap portions of a loop of strap and a driven tensioning member mounted for operative engagement with the outer strap portion intermediate the longitudinal ends of the base for longitudinally feeding the outer strap portion forwardly of the base, the improvement wherein the base has a laterally serrated base portion adjacent the tensioning wheel and is longitudinally tapered therefrom to provide forward and rear ramps, and wherein the tool further comprises a fulcrum member extending outwardly of the strap in overlying relationship therewith, said fulcrum member being mounted in longitudinal alignment with the serrated base portion rearwardly thereof and for reciprocable rectilinear movement outwardly therefrom between an inner extended position and an outer withdrawn position, and means for biasing the fulcrum member inwardly to its extended position, said fulcrum member having a generally L-shaped edge portion with a first laterally extending substantially straight edge part in longitudinal alignment with the serrated base portion, said first edge part being positioned in overlying relationship with the strap for engagement with the outer surface thereof as the strap is tensioned by the driven tensioning member, and a second substantially straight fulcrum edge part extending outwardly from a lateral end of the first edge part, said first edge part in the extended position of the fulcrum member defining with the forward ramp a laterally opening passage adapted for receiving untensioned strap, said fulcrum member being positioned to be withdrawn against said bias by the strap whereby with the strap in its tensioned configuration the tool base can be laterally removed from between the strap and the article by laterally pivoting the tool in one pivotal direction for moving the first edge part of the fulcrum member out of said overlying relationship with the strap and thereafter pivot the tool in the opposite pivotal direction with the second edge part in the extended position of the fulcrum member engaging the lateral edge of the tensioned strap to provide a fulcrum for pivotal removal of the tool.

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