Sept. 27, 1960 E. L. HAYDEN ET AL 2,954,067

TAB STRAIGHTENING DEVICE

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FIG. 1.

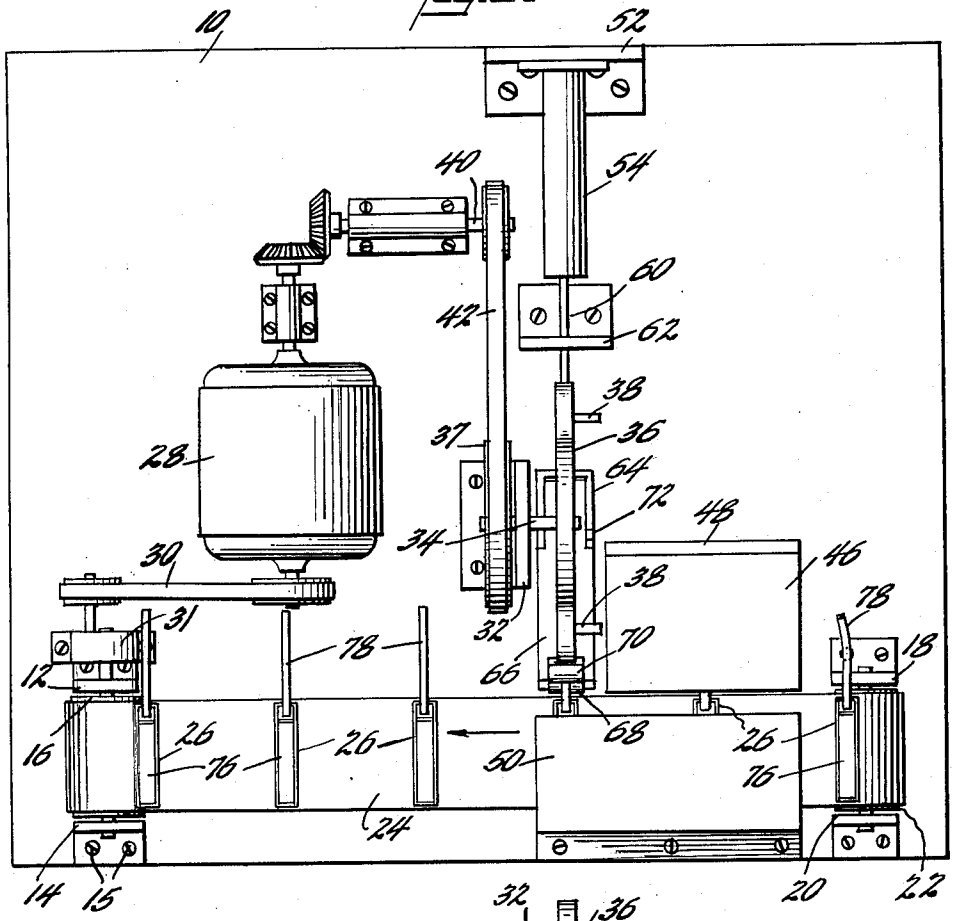
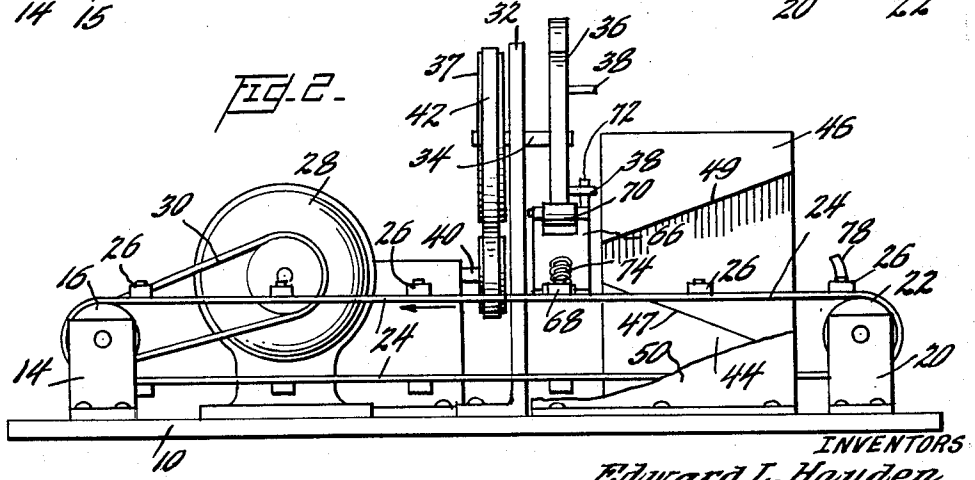


FIG. 2.



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FIG. 3.

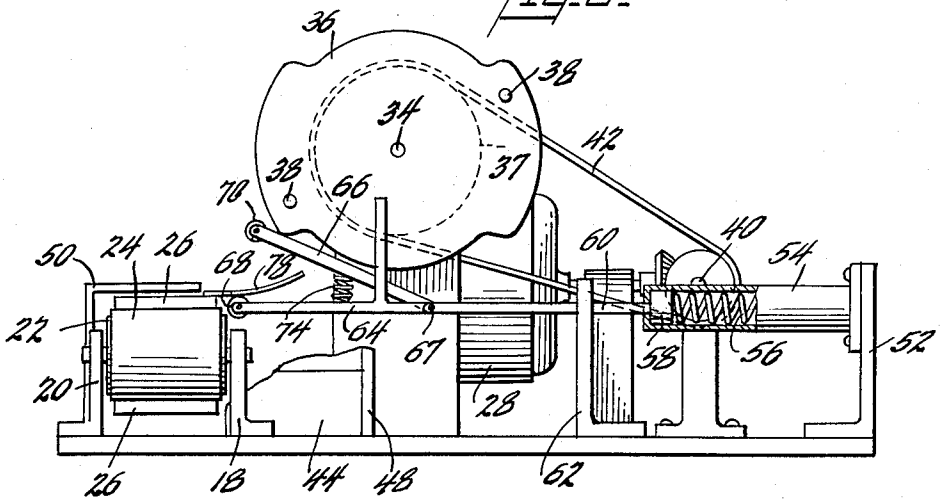
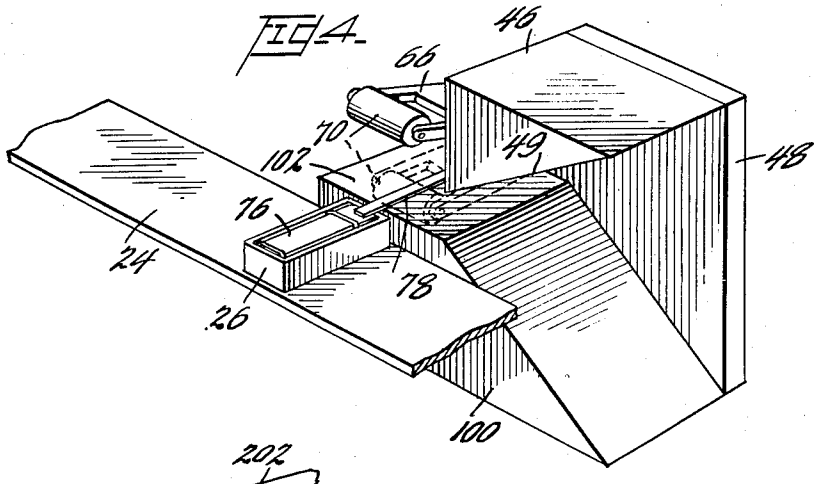


FIG. 4.



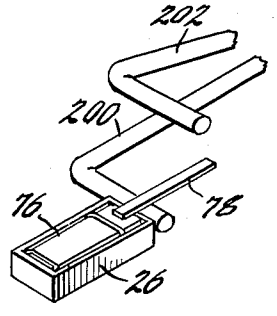


FIG. 5.

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United States Patent Office 2,954,067
Patented Sept. 27, 1960

2,954,067

TAB STRAIGHTENING DEVICE

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Filed Oct. 23, 1958, Ser. No. 769,237
13 Claims. (Cl. 153—32)

This invention relates in general to straightening devices and more particularly to apparatus and methods for straightening the tabs on electron tube cathodes.

In electron tube manufacture a tubular cathode sleeve normally is provided with a ribbon tab at, at least, one of its ends to provide electrical connection between the cathode and a stem lead extending through the base of the tube. This tab may be integral with the cathode sleeve or may be a separate ribbon welded to the sleeve. In either case the cathode sleeve and tab are customarily processed as one unit through degreasing, acid etching and coating steps. In the course of handling the tabbed cathodes through the various steps, the tabs often become bent.

In a previous method for straightening these tabs, an operator would pick up each cathode individually, and while holding the cathode with one hand, would grasp the tab, near its juncture with the cathode sleeve, between the jaws of tweezers held in the other hand, and pull the tab lengthwise through the tweezers, thus straightening the tab. This procedure was tedious and, because of the method used, often required repeated operations since the tab would have a tendency to curl if the tweezers were applied so that the jaws were not held at the proper angle to the cathode sleeve.

It is therefore an object of this invention to provide apparatus and methods for rapidly and accurately straightening tabs on tubular bodies.

It is a further object of this invention to provide apparatus and methods for automatically straightening tabs on tubular electrodes.

Specifically it is an object of this invention to provide traveling receptacles for cathode sleeves with attached tabs to be straightened and to straighten these tabs as the receptacles move past tab straightening mechanism.

Other objects and advantages of the invention will become apparent upon consideration of the following detailed description along with the accompanying drawings, in which:

Fig. 1 is a plan view of one embodiment of the invention with cathode sleeves in some of the receptacles.

Fig. 2 is a front elevational view of the embodiment of the invention depicted in Fig. 1, with parts broken away to expose otherwise hidden portions.

Fig. 3 is a side elevational view of the embodiment of the invention shown in Fig. 1 with ramps removed for clarity;

Fig. 4 is a partial view, in perspective, showing another embodiment of the invention;

Fig. 5 is a partial view, in perspective, showing still another embodiment of the invention.

Referring now more particularly to Figures 1, 2 and 3, the embodiment of the invention shown comprises a base 10 having at the left hand end, Fig. 1, a pair of upright pulley supports 12 and 14 secured to the base by screws 15 and mounting the shaft of a pulley 16. At the right end of the base is a similar pair of supports 18 and 20 rotatably mounting the shaft of a second pulley 22. A

conveyor 24 having fixed thereon a plurality of equally spaced retaining fixtures 26 is entrained about the pulleys. The pulley 16 is driven by a motor 28, via a belt 30 and a Geneva drive 31. Each of the retaining fixtures comprises a shallow rectangular receptacle of a length, width and height to just snugly accommodate the slightly lesser dimensioned cathode sleeves whose tabs are to be straightened, the tabs extending, unrestrained, over the rear end wall of the receptacle.

An upright support member 32 is secured to base 10 and provides a bearing for a shaft 34, said shaft mounting a double lobed disc cam 36 with diametrically spaced pins 38 at right angles to the face of the cam and a drive pulley 37. Said shaft, cam and pulley are driven by a countershaft 40, which is gear connected to motor 28 through a belt 42 entrained about the pulley 37 and a pulley on the shaft 40.

The conveyor belt travels counterclock-wise with its upper run traveling to the left in Fig. 2. Near the right hand end of the conveyor and adjacent one edge thereof is a pair of vertically stacked guide blocks 44 and 46 having converging faces in the direction of travel of the top run of the conveyor.

The lower block of the pair, block 44, is suitably secured to the base 10. The upper face is inclined as indicated at 47 to lead a downwardly bent tab on a cathode held in the box 26 toward a horizontal position. The upper block 46 is held in position by being secured to a vertical plate 48 in turn fastened to the lower block 44 and has a lower inclined face 49, both inclined faces converging toward the left. The face 49 will bend downwardly toward the horizontal any tab of a cathode sleeve within a box 26 which is bent upwardly.

A hold-down cover 50 (broken away in Fig. 2) is secured to base 10 and extends over and in close proximity to at least one of the holding fixtures 26 as it moves into position for operation as will be described later.

Fastened to the rear of the base, Fig. 1, is a vertical support 52 to which is fast a long forwardly extending circular tube 54, the tube housing a compression spring 56 and the head 58 of a plunger 60, with the spring reacting between the head of the plunger and the support. The shaft 60 of the plunger extends through the forward end of the housing and through a support 62, also secured to base 10. At the forward end of plunger 60 there is provided a pair of cooperating wide arms 64 and 66, the lower arm 64 being in any well known manner fixedly mounted in relation to the plunger 60 and reciprocative with it, and the upper arm 66 being hinged to the arm 64 by means of a pivotal pin 67. A straightening roller 68 is rotatably mounted in a forked forward end of lower arm 64 and a similar roller 70 is rotatably mounted in a forked forward end of upper arm 66. Additionally, a driver arm 72, seen most clearly in Fig. 3, is secured to lower arm 64. A spring 74 reacting between arms 64 and 66 is adapted to hold arm 66 normally in the angular relationship to arm 64 shown in Fig. 3.

In operation, cathodes 76 with attached tab 78 are placed in holding fixtures 26 at the right side of apparatus, as shown in Figures 1 and 2. Conveyor 24 is set into operation to cause the holding fixtures 26 to be indexed via the Geneva drive 31 so as to bring the fixtures to stationary position before the straightening rollers. The top run of the conveyor moves to the left so that tabs 78 must travel between the faces 47 and 49 of blocks 44 and 46. A bent tab contacts one or the other of the faces and, as the holding fixture approaches the straightening rollers 68 and 70, the tab is partially straightened to assure that it will lie between the rollers. The cam 36 rotates continuously. The relationship of the parts is such that during indexing of the fixtures, the rollers 68 and 70 are separated. After a tab 78 has been posi-

tioned between the straightening rollers, a lobe portion of cam 36 presses on upper arm 66, pushing down roller 70 to press tab 78 against roller 68. The top of roller 68 is at an elevation to just touch the underside of tab 78 when it is horizontal. As cam 36 continues to turn, the lobe portion rides on the upper arm and pin 38 pushes against lever arm 72, forcing arms 64 and 66 with attached straightening rollers 68 and 70 as well as plunger 60 against the action of spring 56.

As a result, straightening rollers 68 and 70 press against tab 78 substantially throughout its length, straightening the tab. Hold-down cover 50, which lies close over a fixture, prevents cathodes from being tilted or pulled out of the fixture during the straightening process.

When pin 38 slides off lever 72, which occurs when the straightening rollers 68 and 70 having cleared the end of the tab 78, conveyor 24 again indexes, and spring 56 advances plunger 68 and arms 64 and 66 with separated rollers into position into vertical alignment with the next oncoming tab. Although the preferred timing is such that there is but one cycle of operation for the straightening rollers for each conveyor indexing movement, the gearing may be such as to enable several cycles to take place.

In the modification shown in Fig. 4, the lower guide block 100 has a horizontally disposed anvil portion 102 with its upper surface at the same height as the desired lower surface of cathode tab 78, and parallel to the runs of the conveyor. In this modification, the lower roller is dispensed with and replaced by the surface 102. The upper straightening roller 70 and the conveyor are operated as in the previous species. It will be noted that with this form of invention, the tab is straightened by rolling it out on the surface 102 of the guide block.

Referring now more particularly to Fig. 5 which discloses a third embodiment of the invention, there is shown a pair of straightening rods 200 and 202 in place of arms 64 and 66 and rollers 68 and 70 as shown in Figs. 1, 2 and 3. Likewise, it should now be obvious in view of the above, the roller 70 of Fig. 4 may be replaced by a rod such as the rod 202 in Fig. 5. Thus the structure is simplified, although the form of invention employing a roller or rollers is preferred.

Although the invention has been described with particularity, it is understood that the present drawings and specification have been used only by way of examples and that numerous changes in the details of construction and the combination and arrangement of parts may be resorted to without departing from the spirit and the scope of the invention as hereinafter claimed.

What is claimed is:

1. A tab straightening device comprising a conveyor, spaced fixtures on said conveyor and adapted to hold articles with tabs extending across the direction of run of the conveyor, means for progressively straightening said tabs comprising a pair of tab engaging means, one on each side of a tab, mechanism mounting said tab engaging means for rectilinear movement, and means for moving at least one of said engaging means so as to engage a tab close to the conveyor and to move said one engaging means in a direction along the entire length of the tab to straighten the tab.

2. A tab straightening device comprising a conveyor, spaced hollow fixtures, open at their upper faces, on said conveyor and adapted to hold articles with tabs extending across the direction of run of the conveyor, a hold down extending over the hollow fixtures to retain articles therein, means for straightening said tabs comprising a pair of tab engaging means, one on each side of a tab, and means for moving at least one of said engaging means along a rectilinear path so as to engage a tab close to the conveyor and to move the engaging means in a direction along the entire length of the tab to straighten the tab.

3. A tab straightening device comprising a holding fixture adapted to contain the body portion of a tabbed workpiece, the tab of said workpiece extending beyond one end of said holding fixture, a fixed anvil adjacent said one end of said holding fixture, a cooperating rectilinearly movable straightening member, means for bringing said straightening member into contact with said tab to press said tab against said anvil and means for effecting relative motion between said holding fixture and said straightening member to progressively press substantially the entire length of the tab against the anvil, thus straightening said tab.

4. A tab straightening device comprising a holding fixture adapted to contain the body portion of a tabbed workpiece, the tab of said workpiece extending beyond one end of said holding fixture, a fixed anvil adjacent said one end of said holding fixture, a cooperating rectilinearly movable straightening roller, means for bringing said straightening roller into contact with said tab to press said tab against said anvil and means for effecting relative motion between said holding fixture and said straightening roller to progressively press substantially the entire length of the tab against the anvil, thus straightening the tab.

5. A tab straightening device comprising a holding fixture adapted to contain the body portion of a tabbed workpiece, the tab of said workpiece extending beyond one end of said holding fixture, a pair of cooperating straightening members adjacent said one end of said holding fixture, at least one of said straightening members being mounted for movement on the other and movable downwardly substantially perpendicularly toward the tab, the other straightening member supporting the under portion of the tab, whereby the tab is held closely between the straightening members, and means for effecting relative rectilinear motion between said holding fixture and said straightening members to progressively press substantially the entire length of the tab between the straightening members.

6. A tab straightening device comprising a holding fixture adapted to contain the body portion of a tabbed workpiece, the tab of said workpiece extending beyond one end of said holding fixture, a pair of cooperating straightening rollers adjacent said one end of said holding fixture, at least one of said straightening rollers being movable downwardly substantially perpendicularly toward the tab, the other straightening roller supporting the under portion of the tab, whereby the tab is held closely between the straightening rollers, and means for effecting relative rectilinear motion between said holding fixture and said straightening rollers to progressively press substantially the entire length of the tab between the rollers.

7. A tab straightening device comprising a base, a conveyor movably mounted on said base, said conveyor carrying a plurality of equally spaced holding fixtures, said holding fixtures being adapted to contain the body portions of tabbed workpieces with the tabs extending beyond one side of the conveyor, means for indexing said conveyor to bring each workpiece in succession to a work station, a pair of blocks having converging faces between which a tab must pass as it approaches the work station to partially straighten badly bent tabs, an anvil secured to the base at said work station, said anvil being so disposed as to support the under side of the tab, a straightening member above the anvil and adjacent said work station, means operative between conveyor indexing movements for moving said straightening member downward into contact with said tab whereby the tab is closely held between the straightening member and the anvil and means for effecting relative motion between said holding fixture and said straightening member to progressively press substantially the entire length of the tab against the anvil.

8. A tab straightening device comprising a base, a conveyor movably mounted on said base, said conveyor consisting in part of a plurality of equally spaced holding

fixtures, said holding fixtures being adapted to contain the body portions of tabbed workpieces, the tabs extending beyond one side of the conveyor, means for indexing said conveyor to bring each workpiece in succession into a work station, a pair of blocks having converging faces between which a tab must pass as it approaches the work station, a pair of straightening members reciprocably mounted on said base, one of said straightening members being adapted to support the under side of the tab, means operated between conveyor indexing movements for moving the other of said straightening members into contact with the tab so that the tab is closely held between the straightening members and means for moving said straightening members laterally away from said holding fixture to progressively press substantially the entire length of the tab between the straightening members.

9. A tab straightening device comprising a base, a holding fixture mounted on said base, said holding fixture being adapted to contain the body portion of a tabbed workpiece, the tab of said workpiece extending beyond one end of said holding fixture, a tab straightening means including a pair of tab engaging means, one for each of two opposite faces thereof on said base, said straightening means including a straightening member reciprocably mounted, a driver arm at right angles to said straightening member, an arm having tab engaging means pivoted on said straightening member, a disc cam rotatably mounted on the base adjacent the straightening member, a pin secured to said cam and extending from one face thereof, means for rotating said cam so that its periphery bears on the pivoted arm whereby the tab engaging means on the free end of the arm is forced into contact with the tab to press the tab against the action of the tab engaging means and whereupon the pin on the cam contacts the driver arm to move the straightener bar and pivoted arm, thereby pressing substantially the entire length of the tab between the tab engaging means.

10. A tab straightening device comprising a base, a holding fixture mounted on said base, said holding fixture being adapted to contain the body portion of a tabbed workpiece, the tab of said workpiece extending beyond one end of said holding fixture, a pair of cooperating straightening members reciprocably mounted on said base, one of said straightening members being pivoted to the other so that it is movable in a plane perpendicular to the plane of reciprocation, said pivoted straightening member consisting of a straightener bar and a driver arm at right angles thereto, a cam rotatably mounted on the base adjacent the pivoted straightening member, a lobe portion on said cam, a pin secured to said cam and extending from one face thereof, means for rotating said cam so that the lobe portion bears on the bar whereby the free end of the bar is forced into contact with the tab to press the tab against the end of the other straightening member and whereby, upon continued rotation of the cam, the pin on the cam contacts the driver arm to move the tab engaging ends of said straightening members longitudinally of the tab and pressing substantially the entire length of the tab between said ends.

11. A tab straightening device comprising a base, an indexible conveyor mounted on the base, equally spaced holding fixtures secured to the conveyor, each holding

fixture being adapted to contain the body portion of a tabbed workpiece, the tab of said workpiece extending beyond one end of said holding fixture, a tab straightening means including a pair of tab engaging means, one for each of two opposite faces thereof on said base, said straightening means including a straightening member reciprocably mounted, a driver arm at right angles to said straightening member, an arm having tab engaging means pivoted on said straightening member, a disc cam rotatably mounted on the base adjacent the straightening member, a pin secured to said cam and extending from one face thereof, means for rotating said cam so that its periphery bears on the pivoted arm whereby between conveyor indexing movements the tab engaging means on the free end of the arm is forced into contact with the tab to press the tab against the other of the tab engaging means and whereupon the pin on the cam contacts the driver arm to move the straightener bar and pivoted arm, thereby pressing substantially the entire length of the tab between the tab engaging means.

12. A tab straightening device comprising a base, an indexible conveyor mounter on the base, equally spaced holding fixtures secured to the conveyor, each holding fixture being adapted to contain the body portion of a tabbed workpiece, the tab of said workpiece extending beyond one end of said holding fixture, a pair of cooperating straightening members reciprocably mounted on said base, one of said straightening members being pivoted to the other so that it is movable in a plane perpendicular to the plane of reciprocation, said pivoted straightening member consisting of a straightener bar and a driver arm at right angles thereto, a cam rotatably mounted on the base adjacent the pivoted straightening member, a lobe portion on said cam, a pin secured to said cam and extending from one face thereof, means for rotating said cam so that the lobe portion bears on the bar whereby between conveyor indexing movements the free end of the bar is forced into contact with the tab to press the tab against the end of the other straightening member and whereby, upon continued rotation of the cam, the pin on the cam contacts the driver arm to move the tab engaging ends of said straightening members longitudinally of the tab and pressing substantially the entire length of the tab between said ends.

13. A tab straightener comprising an indexible conveyor, equally spaced fixtures mounted on said conveyor and each adapted to hold an article with an attached tab extending beyond a side of said conveyor, a tab straightener movable in a rectilinear path to one side of said conveyor operating in timed relationship to said conveyor indexing, and means to effect engagement of said straightener with a tab, near the article attached end thereof, and to withdraw the straightener longitudinally of said tab along its entire length while the conveyor is at rest.

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