July 6, 1965 E. A. LAINE 3,192,834

DEVICE FOR DEBURRING METAL STRIP

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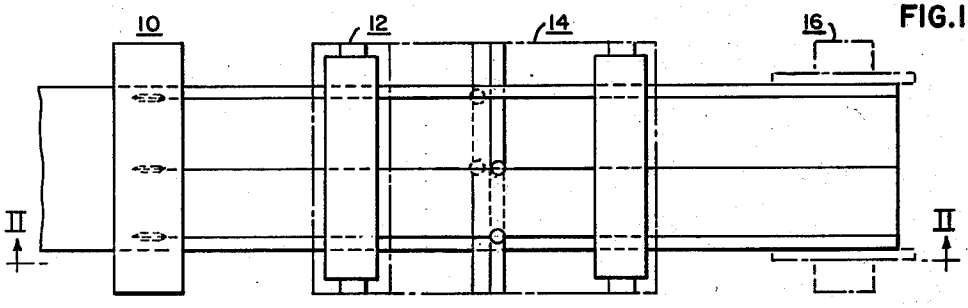



FIG.1

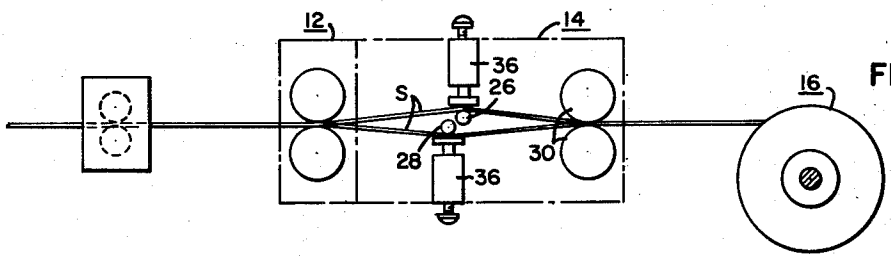



FIG.2

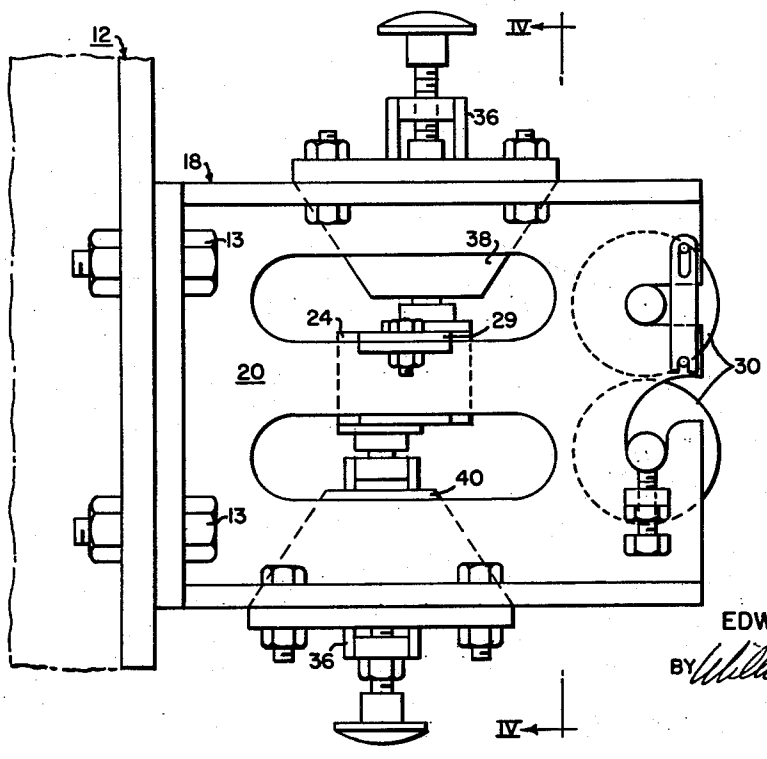



FIG.3

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DEVICE FOR DEBURRING METAL STRIP

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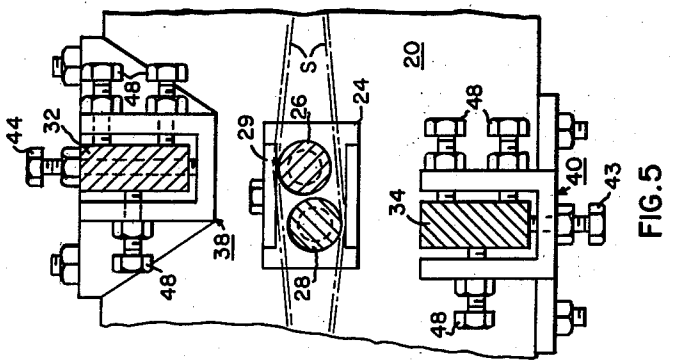


FIG.5

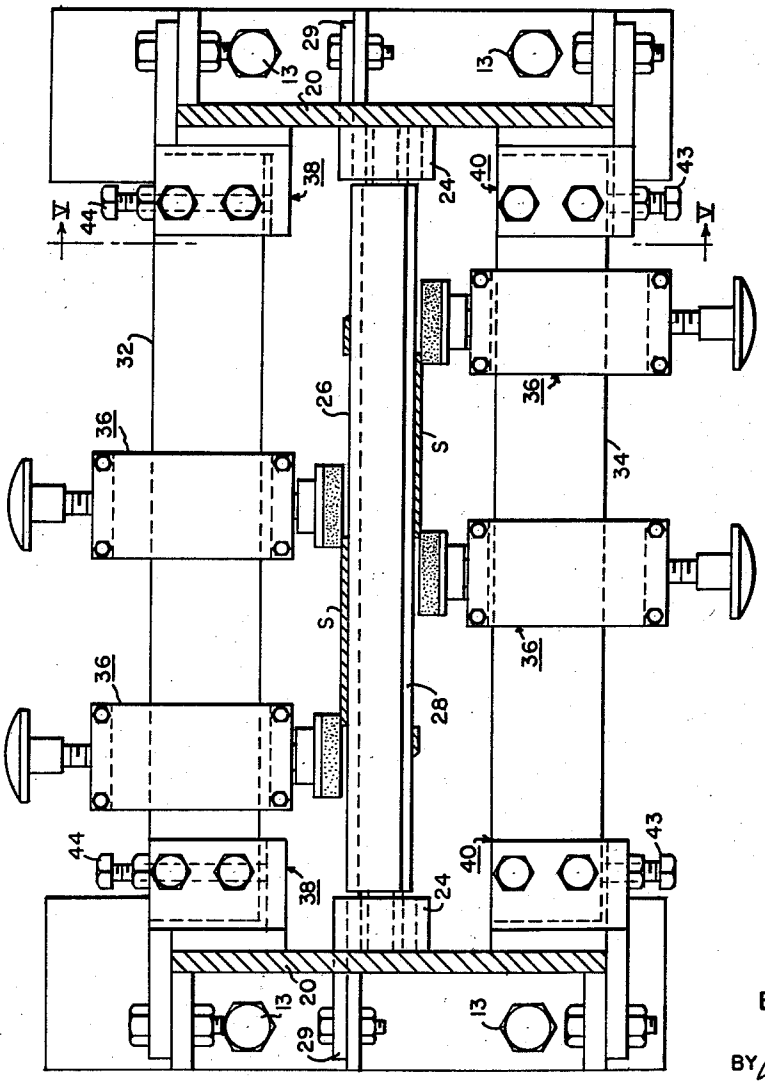


FIG.4

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DEVICE FOR DEBURRING METAL STRIP

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FIG.6

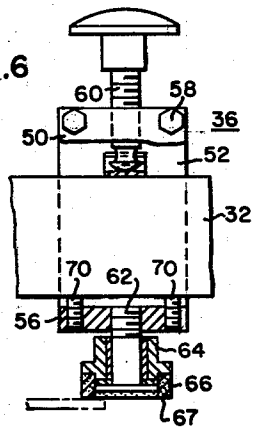
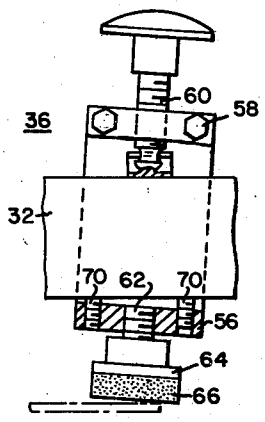



FIG.7



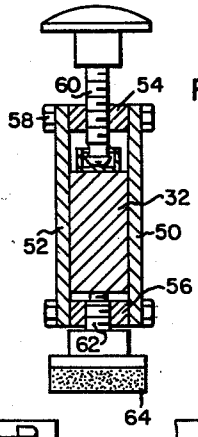




FIG.8

FIG.9

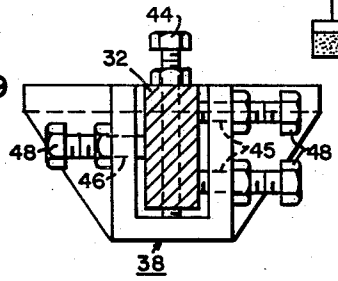



FIG.10

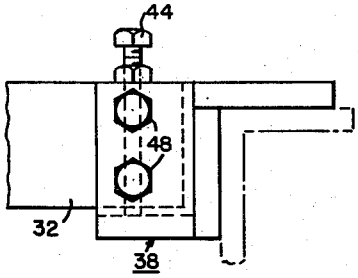



FIG.11

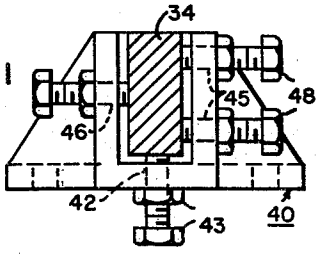
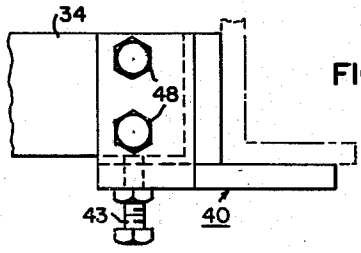



FIG.12



United States Patent Office 3,192,834 Patented July 6, 1965



3,192,834

# DEVICE FOR DEBURRING METAL STRIP

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Filed Apr. 5, 1963, Ser. No. 270,930
12 Claims. (Cl. 90—24)

This invention relates to apparatus for and processing of metal strip material and more particularly to deburring strands slit from a wide strip of material.

In producing narrow strands or strips of material such as stainless steel, silicon steel and other metals, one common practice is to produce a wide strip of material which can be more easily and economically processed to the desired thickness. This wide strip is then slit into multiples of narrow strands of the desired width. The slitting is normally accomplished with circular slitter knives which results in a thin sliver of material projecting outwardly from one side of each slit edge of the strands, these thin slivers of material being commonly referred to as "burrs." These burrs project past the surface of the material and therefore must normally be removed before the strip is sold to prevent injury to people or damage to subsequent processing equipment and to afford a uniform thickness across the width of the strip so that pieces cut from the strip will stack to a uniform height. These burrs also cause ripples on the edges of the strip when the strip is wound on a reel which affects the flatness of the strip.

It is, therefore, a principal object of this invention to provide a device for removing burrs from strands of material slit from a wider strip of material.

Yet another object of this invention is the provision of a device for removing burrs from strands of material which can be used in conjunction with a slitting device to continuously remove the burrs as the strands are slit.

Still a further object of this invention is the provision of a device which is adapted to continuously deburr all of the strands of material simultaneously as they emerge from the slitting operation.

Yet another object of this invention is to provide an improved mounting for a deburring cutter which will permit facile adjustment for efficient operation.

These and other objects will become apparent from the following description when taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a plan view somewhat schematic of an apparatus for deburring strip according to this invention;

FIG. 2 is an elevational view looking substantially in the direction of line II—II of FIG. 1;

FIG. 3 is an end elevational view of the deburring device of this invention;

FIGURE 4 is a sectional view looking substantially in the direction of line IV—IV of FIG. 3;

FIG. 5 is a sectional view looking substantially in the direction of line V—V of FIG. 4. FIGS. 6, 7 and 8 are detailed views of the mounting of the deburring cutters, and FIGS. 9, 10, 11 and 12 are detailed views of the mounting of the support bar for the cutters.

Referring now to the drawings and particularly to FIGS. 1 and 2, the device of this invention is shown in conjunction with a conventional set of slitter knives **10** adapted to slit a wide strip of material into a plurality of narrower strips or strands "S." The wide strip of material is normally in the form of a coil mounted on an uncoiler (not shown) and is drawn through the slitter knives shown schematically at **10** and pinch rolls **12** by a recoiler **16**. As the wide strip of material is drawn through the slitter knives **10**, the knives rotate to slit the material to the desired width. The adjustment of these slitter knives for different widths is conventional. From the rolls **12**, the



severed strands of material are delivered to the deburring device of this invention designated generally as **14**, and from thence to the recoiler **16**.

The slitter knives **10** are arranged so that the burrs on opposite edges of the same strand extend in the same direction, i.e., either up or down; therefore, the burrs on alternating strands of material are directed alternately up and down. The deburring device **14** is arranged to direct the strands having their burrs extending upwardly onto an upper path of travel and the strands having their burrs extending downwardly onto a lower path of travel. The burrs are removed from these strands by the deburring device **14** and the strands are then brought back together and coiled on the recoiler **16**.

Referring now to FIGS. 3 through 5, the deburring device **14** includes a support frame **18** which is bolted to the frame of the rolls **12** by bolts **13**. The support frame **18** includes a pair of spaced side plates **20**. The side plates **20** support bearing blocks **24** which journal an upper roll **26** and a lower roll **28**. The rolls **26** and **28** are spaced and freely rotatable in the bearing blocks **24** and retained therein by slidable retainer plates **29** secured to the side plates **20**. The rolls may be readily removed together with the two bearing blocks for threading strip or other access. The strands having their burrs directed upwardly pass over the upper roll **26** and the strands having their burrs directed downwardly are passed under the lower roll **28** where the burrs are removed as will be described. The strands "S" are then brought back to a common path of travel by a pair of pinch rolls **30** which deliver the strands "S" to the recoiler **16**. The pinch rolls **12** and **30** serve to hold the strands "S" tightly against the upper and lower rolls **26** and **28**.

An upper support beam **32** and a lower support beam **34** span between the side plates **20** and are adapted to support milling cutters designated generally as **36** adjacent the upper and lower rolls **26** and **28** for the purpose of deburring the strands as they pass the rolls **26** and **28**.

A pair of generally U-shaped support brackets **38** are bolted to the top of the side plates **20** and support the upper support beam **32** and a pair of U-shaped support brackets **40** are also mounted to the bottom of the side plates **20** and support the lower support beam **34**. The lower support brackets **40** are provided with tapped holes **42** in which are threaded adjusting bolts **43**. The lower beam **34** rests on these adjusting bolts **43** and the height of the beam can be adjusted by the movement of these bolts. The height of the upper beam **32** can be adjusted by bolts **44** which are threaded through opposite ends of the beam and which rest on the U-shaped brackets **38**. Each of the support brackets **38** and **40** is provided with a pair of tapped holes **45** on one leg of the U and a single tapped hole **46** on the other leg of the U (FIGURES 9 through 12). Adjusting screws **48** are threaded in these holes and bear against the beams **32** and **34** for adjustment of the rake angle of the cutters as will be described presently.

Referring now to FIGS. 6 through 8, a milling cutter is shown mounted on the upper beam **32**. The other cutters on beam **32** are similarly constructed and mounted and the cutters on the lower beam **34** are similarly constructed but mounted in an inverted position to project up toward the bottom of the srtips "S." Each of the cutters includes a pair of spaced side plates **50** and **52** and a pair of end plates **54** and **56** connected between the side plates **50** and **52** by bolts **58**. One end plate **54** has a tapped hole which threadably engages a clamping bolt **60**. The other end plate **56** has a tapped hole in which is threadably secured a stationary shaft **62**. A cutting head **64** having a carbide insert **66** which provides a flat cutting face **67** is journaled on the shaft **62** and is freely rotatable thereon.

In order to provide for tilting of the milling cutters to undercut the sides of the strands, the milling cutters are provided with a pair of adjusting screws 70 which are threaded through the end plate 56. These screws are adjusted to select the proper angle of the milling cutter and when adjusted as shown in FIG. 7, the cutters will undercut the sides of the strand.

In setting the height of the milling cutters, the upper and lower beams 32 and 34 are removed from their respective brackets and the relative positions of the milling cutters is obtained by loosening of the clamping bolt 60. The cutters are positioned on the beam and the angles of their undercut adjusted by adjusting the screws 70 which also are used to adjust each to project the same distance from the beam. The clamp bolts 60 are then tightened and the beams are replaced in the brackets 38 and 40.

Referring now to FIGS. 9 through 12, the distance of the cutters from the rolls 26 and 28 is adjusted by adjusting the bolts 43 and 44. The rake angle of the cutters can be adjusted on all of the upper cutters together and all of the lower cutters together by means of the adjusting screws 48 in the support brackets 38 and 40. Adjustment of these screws will allow the support bar to be tilted to allow the leading edge of the cutter to engage the incoming strands.

In positioning the cutting head 64 against the burr, it is necessary that the burr engage the cutting face 67 between the outer periphery of the cutting head and its axis of rotation. In this manner, the freely rotatable cutting head will rotate at a speed slower than the speed of the strip which will allow a shearing action to take place and also permit a rotary movement of the cutter head 64 during this shearing action. This rotating, shearing movement of the cutting head coupled with a journaled support roll, provides a clean, smooth cut removing the burr without damage to either side of the strip.

Although one embodiment of this invention has been shown and described, various adaptations and modifications can be made without departing from the spirit and scope of the appended claims.

I claim:

1. Apparatus for removing edge burrs from a plurality of narow strands slit from a wide strip of metal wherein the burrs of both edges of each strip extend in the same direction and the burrs on adjacent strips extend alternately up and down, said apparatus comprising, first means adapted to divert the strips having edge burrs extending up onto an upper path of travel, second means adapted to divert the strips having edge burrs extending down onto a lower path of travel, a first set of cutters positioned to deburr the edges of the strips on the upper path of travel, a second set of cutters positioned to deburr the edges of the strips on the lower path of travel, and means to selectively position said first and second sets of cutters laterally with respect to the paths of travel of the strands.

2. The combination of claim 1 further characterized by means to adjust the rake angle of the cutters.

3. The combination of claim 1 further characterized by means to adjust the cutters to undercut the edges of the strands.

4. Apparatus for removing edge burrs from a plurality of narrow strands slit from a wide strip of metal wherein



the burrs on both edges of each strand extend in the same direction and the burrs on adjacent strands extend alternately up and down said apparatus comprising, an upper roll adapted to divert the strands having edge burrs extending up onto an upper path of travel, a lower roll adapted to divert the strands having edge burrs extending down onto a lower path of travel, a first support member adapted to support a first set of cutters adjacent said upper roll, a second support member adapted to support a second set of cutters adjacent the lower roll, and releasable clamp means adapted to selectively position said cutters on said support members.

5. The combination of claim 4 wherein said releasable clamp means includes means to adjust said cutters to vary their distance from the rolls.

6. The combination of claim 5 further characterized by said clamp means including adjusting screws adapted to tilt said cutters to undercut the edges of the strip.

7. The combination of claim 5 further characterized by adjusting screws adapted to adjust the angle of the support members with respect to the strands in a plane to adjust the rake angle of the cutters.

8. The combination of claim 4 further characterized by bracket means adapted to support said first and second support members for facile removal and replacement.

9. The combination of claim 4 further characterized by means to adjust the distance of the support members from their respective rolls.

10. Apparatus for removing an edge burr from a moving strand of material comprising, a roll journaled for rotation and disposed to support the moving strand with the burr directed away from the roll, a circular cutting head, means rotatably supporting said cutting head adjacent said roll, and means to position said cuting head to engage the burr between the cutting head's outer periphery and its axis of rotation.

11. The combination of claim 10 wherein said means to support said cutting head includes a support beam and the means to position said cutting head includes clamping means to releasably secure said cutting head to said support beam.

12. The combination of claim 11 further characterized by said means to positioned the cutting head including adjustable set screws disposed to adjust the angle of cut of the cutting head.


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