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[50] **Field of Search**..... 15/100,
 102, 301, 302, 303, 306, 307, 316, 405, 407, 415,
 339, 394; 134/9, 15, 123

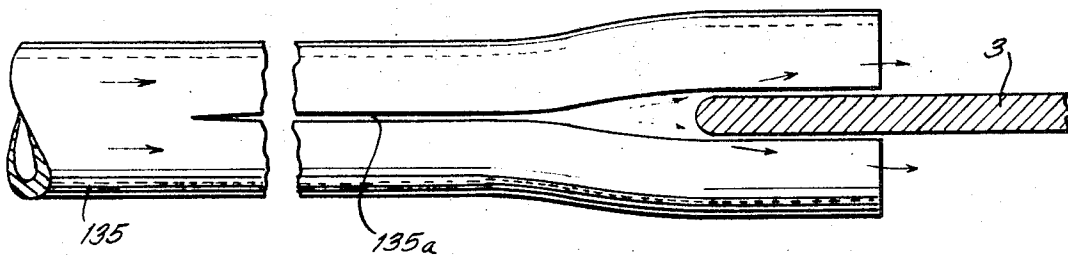
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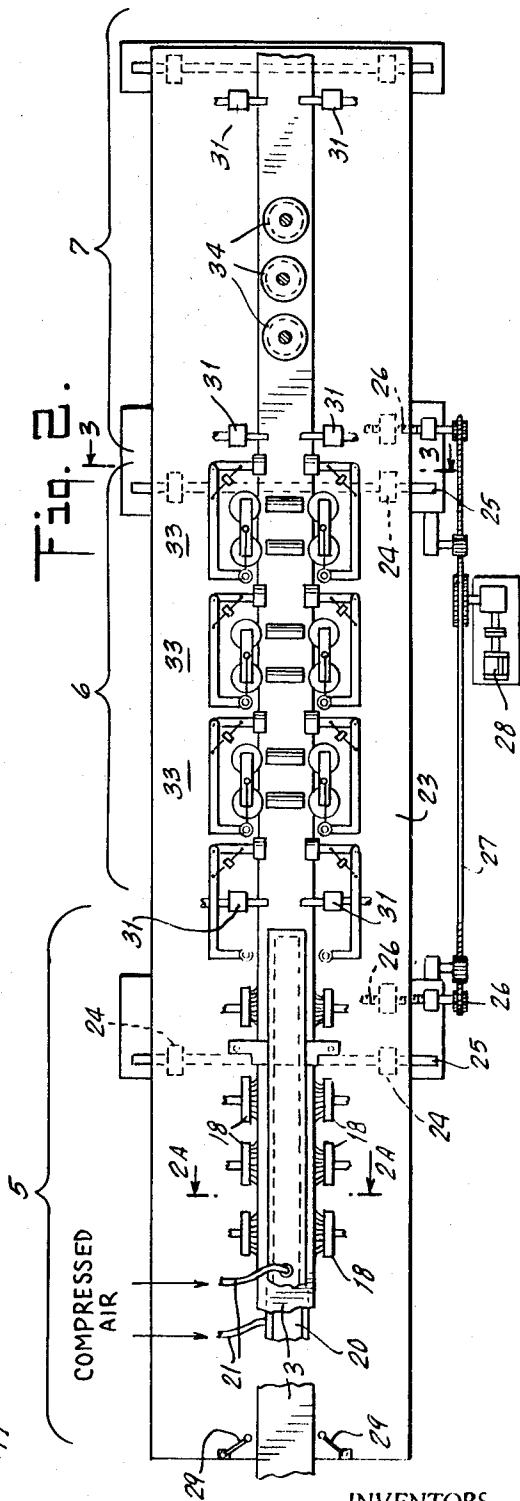
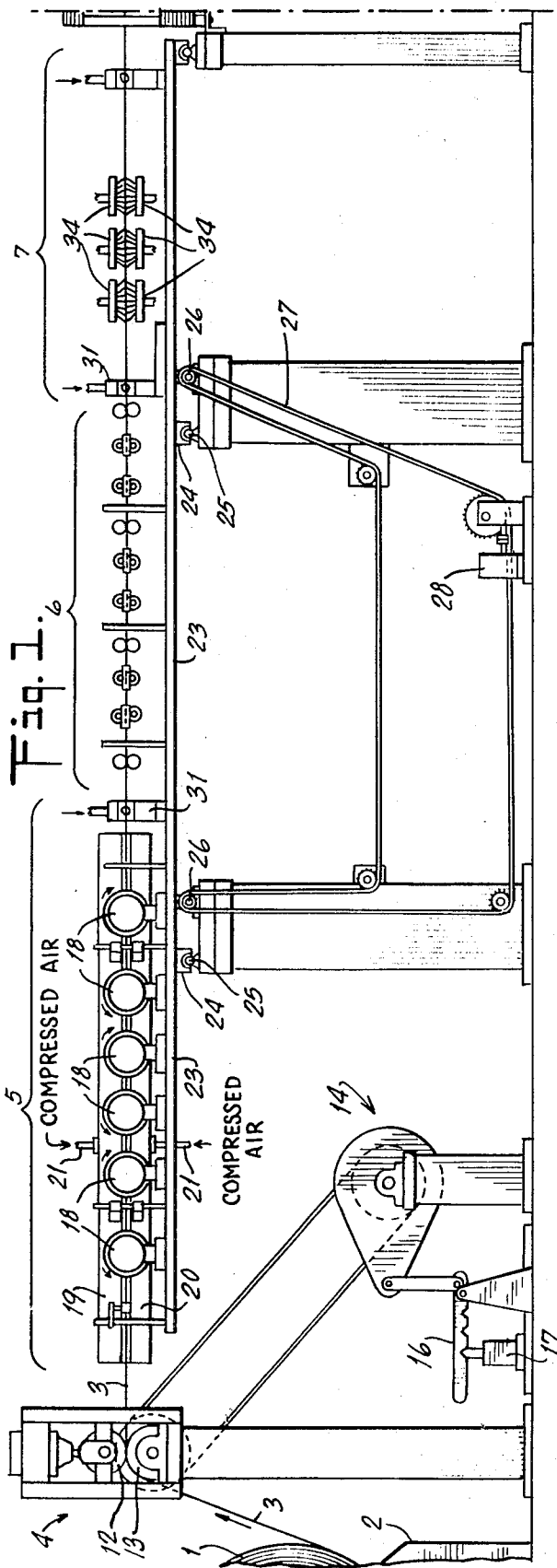
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[54] **APPARATUS FOR CLEANING THE EDGES OF STRIP MATERIAL BY THE APPLICATION OF FLUID UNDER PRESSURE**
3 Claims, 7 Drawing Figs.

[52] **U.S. Cl.**..... **15/302,**
 15/307, 15/308, 15/316, 15/339, 15/415, 51/8,
 134/122
 [51] **Int. Cl.**..... **B08b 5/02**

ABSTRACT: The fluid cleaning apparatus comprises a tube having an open end and diametrically opposite slits through which the edge of the material passes. Compressed air is supplied to the hose and blows away any splinters or particles clinging to the edges. The compressed air cleaning is employed after a rolling or brushing operation.





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Fig. 2A.

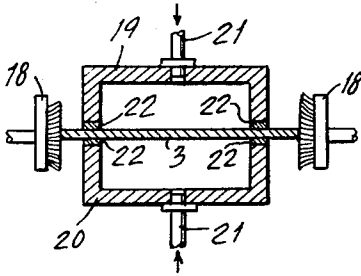


Fig. 3.

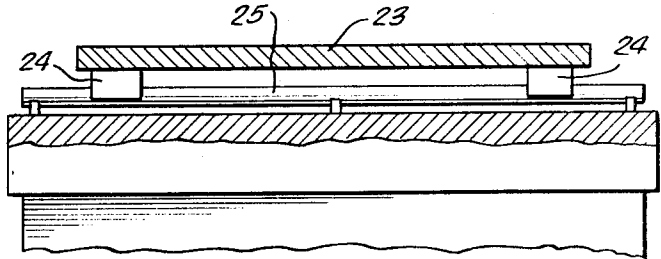


Fig. 4.

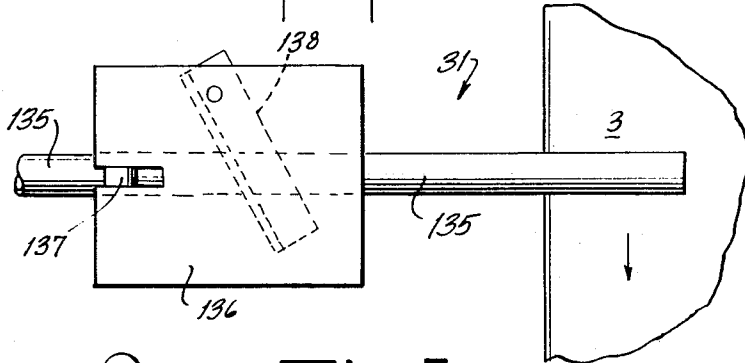


Fig. 5.

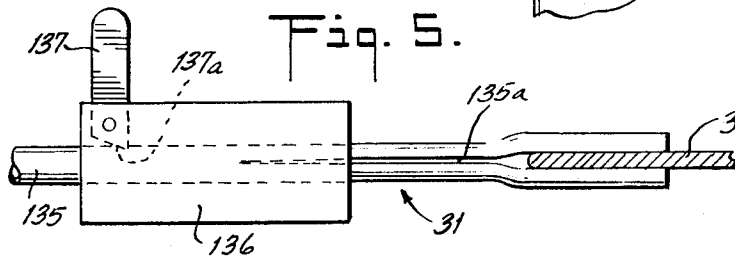
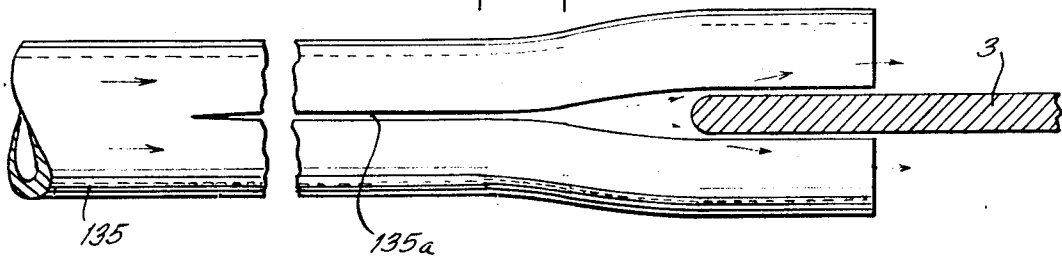


Fig. 6.



APPARATUS FOR CLEANING THE EDGES OF STRIP MATERIAL BY THE APPLICATION OF FLUID UNDER PRESSURE

CROSS REFERENCE

This application is a division of my copending application Ser. No. 632,758, now U.S. Pat. No. 3,479,852, filed Apr. 21, 1967, for ROLLING APPARATUS FOR ROUNDING THE EDGES OF STRIP METAL.

BACKGROUND OF THE DISCLOSURE

The invention is particularly useful for rounding the edges of flat strips of foils of aluminum which are intended to be used as electrical windings or capacitors. Such strips or foils are commonly first manufactured by cutting or slitting a wider strip or sheet, and have sharp corners at their edges resulting from the cutting or slitting operation. They may also have occasional slivers or small particles clinging to their edges.

The strip is either interleaved with an insulating material such as a paper, or the strip may be coated with an insulating material before it is wound into a coil. A clean, smoothly contoured edge is required to prevent puncture of the insulation by burrs, slivers, etc., to maintain purity of cooling and/or insulating fluid where a fluid-cooling is used, and to attenuate corona discharge. In those cases where a liquid insulating coating is applied, a smooth curved surface facilitates a more uniform coating, since if the strip has a sharp corner, the surface tension of the liquid film will reduce the thickness of the coating at that corner.

The prior art teaches the use of edge-forming rolls having rounded grooves engaging the edge of a strip of metal and effective to produce a round contour on the strip. Such rolls, if employed according to the teachings of the prior art, are effective to form the edges, but have a tendency to produce ridges in the flat surfaces of a strip at a point adjacent the edges. Furthermore, the prior art edge-forming rolls have a tendency to squeeze the strip laterally, thereby causing it to buckle in the middle. While this is not important in dealing with strips of substantial thickness and material of substantial strength, e.g., steel, it presents difficulties when dealing with weaker metals such as aluminum.

SUMMARY OF THE INVENTION

The invention comprises means defining a path for moving strip material, and edge-rolling and edge-cleaning means mounted to cooperate with a strip moving along that path. A strip moving through the apparatus disclosed herein first encounters an edge-cleaning station, where the edges of the strip are brushed by a series of brushes rotating about horizontal axes aligned with the strip, with successive brushes turning in opposite directions. In order to prevent the lateral force of the brushes from buckling the strip, the central portion of the strip passes between the upper and lower plenum chambers which are maintained under pressure, preferably by means of compressed air.

After passing the edge-brushing station, the strip passes between two fluid edge cleaners, which comprise tubes or hose slit at their open end so that the edge passes through the slits. The tubes are supplied compressed air, which issues in a high velocity stream so that any particles clinging to the edges are blown away.

The strip next passes to a rolling station where it encounters a first set of edge-thickness control rolls. These rolls engage the flat surfaces of the strip and overlap the edges thereof.

Following the edge-thickness control rolls, the strip passes through three sections of the rolling station, each section comprising two sets of edge-forming rolls followed by a single set of edge-thickness control rolls similar to the first one. Upon leaving the rolling station, the strip passes another fluid edge-cleaning station, similar to the one at the end of the edge-brushing station. The strip next passes through a final cleaning

station where it first encounters a set of brushes rotating on vertical axes and engaging the flat surfaces of the strip. This is followed by another fluid edge-cleaning and finally by another set of brushes rotating on horizontal axes and engaging the upper and lower flat surfaces of the strip.

DRAWINGS

FIG. 1 forms a fragmentary somewhat diagrammatic elevational view of an edge-rolling apparatus constructed in accordance with the invention, with many parts omitted for the sake of clarity.

FIG. 2 is a plan view of the apparatus of FIG. 1.

FIG. 2A is a sectional view taken along the line 2A—2A of FIG. 2;

FIG. 3 is a sectional view taken on the line 3—3 of FIG. 2;

FIG. 4 is a plan view on an enlarged scale showing one of the fluid edge-cleaning units;

FIG. 5 is an elevational view of the fluid edge-cleaning unit of FIG. 4;

FIG. 6 is a fragmentary view similar to a portion of FIG. 5, but on an enlarged scale.

DESCRIPTION OF THE INVENTION

FIGS. 1 and 2

These figures illustrate somewhat diagrammatically, a complete edge-rounding apparatus in accordance with the invention.

A coil 1 of strip aluminum is mounted on a supply reel 2 (shown as a fragment at the left end of FIG. 1). The aluminum passes as a strip 3 from the supply reel 2 to a pinch roll stand 4 of conventional construction, which regulates the tension in the strip. From the pinch roll stand 4, the strip 3 passes through a first cleaning station 5, a rolling station 6, and a final cleaning station 7.

The principal features of novelty of the present invention are in the cleaning stations 5 and 7. The other parts of the apparatus will be only briefly described.

The pinch roll stand 4 comprises a rubber-faced water-cooled 12 and a steel-faced roll 13. The strip 3 is pinched between the two rolls. The steel-faced roll drives a pneumatic, water-cooled brake generally indicated at 14, the drive being through pulleys and a belt 15. The brake torque is adjustable by means of a bellcrank lever 16, which acts on a pneumatic load cell 17. The longitudinal tension on the strip 3 as it passes through the cleaning station 5, the rolling station 6 and cleaning station 7 may be set and controlled by the brake 14.

The strip 3 passing through the cleaning station 5 passes between opposed rows of rotary brushes 18 turning on horizontal axes extending at right angles to the direction of movement of the strip. Between the brushes, the central portion of the strip passes between upper and lower plenum chambers 19 and 20 which are connected by suitably conduits 21 to a source of compressed air. The edges of the plenum chambers where they contact the strip 3 are faced with nylon or other suitable material as shown at 22 so that the chambers do not mar or scratch the strip surface. Air is continuously leading between the strip and the facings 22.

The entire cleaning and rolling apparatus shown in FIG. 1 including the precleaning station 5, the rolling station 6 and that part of the final cleaning station 7 which appears in FIG. 1, is mounted on a platform 23 having on its under surface downwardly projecting saddles 24 which rest on laterally extending rails 25. The platform 23 may be driven along the rails by means of a pair of lead screws 26 (FIG. 2) which are driven by a chain 27 connected through suitable drive mechanism to a reversible motor 28. The motor 28 is controlled by edge feelers 29, which appear at the left end of FIG. 2. The feelers 29 normally have a small clearance from the edge of the strip. If either feeler is contacted by the strip edge, a lateral movement of the strip is indicated, since the strip is of substantially constant width. The contacted feeler 29 actuates the motor 28, to drive the lead screws 26 in a direction to terminate con-

tact between the edge of the strip and the feeler 29, whereupon operation of the motor is discontinued. Thus, the entire cleaning stations and the rolling station are moved laterally and kept in alignment with the strip, so that substantially no stress can be placed on the strip due to a change in its lateral position.

At the end of the cleaning station 5, the strip passes between two opposed fluid-operated edge cleaners 31, which are described in detail in connection with FIGS. 4 to 6 below.

In the rolling station 6, the strip first passes between a pair of edge-thickness control rolls 32 and thence passes through three rolling station sections, each indicated by numeral 33.

Upon entering the final cleaning station 7, the strip first passes through a second pair of fluid-operated cleaning devices 31 (see FIGS. 4 to 6) and then passes between an array of rotary brushes 34, rotating on vertical axes. One set of brushes 34 is located above the strip and the other set below the strip. After passing the brushes 34, the strip passes another pair of fluid-operated cleaning devices 31 and thence passes into the final section of the cleaning station 7.

FIGS. 4 to 6

These figures illustrate in detail the fluid pressure-cleaning device shown at 31 in FIGS. 1 and 2.

The device 31 consists of a tube 135, such as a flexible hose, extending through an aperture in a suitable fixed support 136. The open end of the hose is slit at opposite locations, as shown at 135a. The slits are preferably, but not necessarily, diametrically opposed. The open end of the hose is spread apart so that the opposite halves overlap the marginal edge of the strip 3. Air at high velocity is supplied through the tube 135 and passes out through the open end of the tube, and also between the walls of the tubes and the surfaces of the strip 3. The result is that a high velocity stream of air flows over the marginal and edge surfaces of the strip 3, thereby cleaning any loose materials which may be clinging to those surfaces. The support 136 is provided with a lever arm 137 pivotally mounted on the support and having a wedge-shaped end 137a extending into the aperture through which the tube passes and adapted to engage

and hold the tube 135 against movement. The support 136 is also provided with a fixed knife blade 138 which spans the aperture through which the tube 135 is threaded. As the slit end of the tube wears away, additional lengths of tube can be pushed through the support 136. As the tube is so pushed, the knife 138 slits the tube 135 and prepares it for engagement with the strip 3.

The apparatus of FIGS. 4 to 6 may be used to supply cleaning fluids other than air. Furthermore, the apparatus may be used to supply fluids carrying abrasive particles, or fluids which act on the metal strip by virtue of their own chemical properties, as chemical-machining fluids, etching fluids, and the like.

Although the invention has been described in connection with the edge-contouring of strip aluminum, many features thereof are useful in the rolling of other metals, and some features are useful in processes other than edge-contouring, such as cleaning, abrading, chemical-machining, etc.

While we have shown and described certain preferred embodiments of our invention, other modifications thereof will readily occur to those skilled in the art, and we therefore intend our invention to be limited only by the appended claims.

1. Apparatus for supplying treating fluid to the edge of a strip of material, wherein the improvement comprises:

a. a flexible cylindrical tube having an open end and opposed slits in the tube extending longitudinally thereof from the open end and adapted to receive an edge of the strip;

b. means supply treating fluid through said tube; and

c. means for relatively moving the tube and the strip, with the edge of the strip passing through said slits.

2. Fluid supply apparatus as defined in claim 1, including releasable lock means for holding the tube against movement transverse of the strip.

3. Fluid supply apparatus as defined in claim 1, including knife means for slitting said tube as it is moved toward the strip.

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