

July 11, 1967

C. E. MUELLER ET AL

3,330,144

SHOE FOR USE WITH EDGE ROLLING APPARATUS

Filed Nov. 25, 1964

2 Sheets-Sheet 1

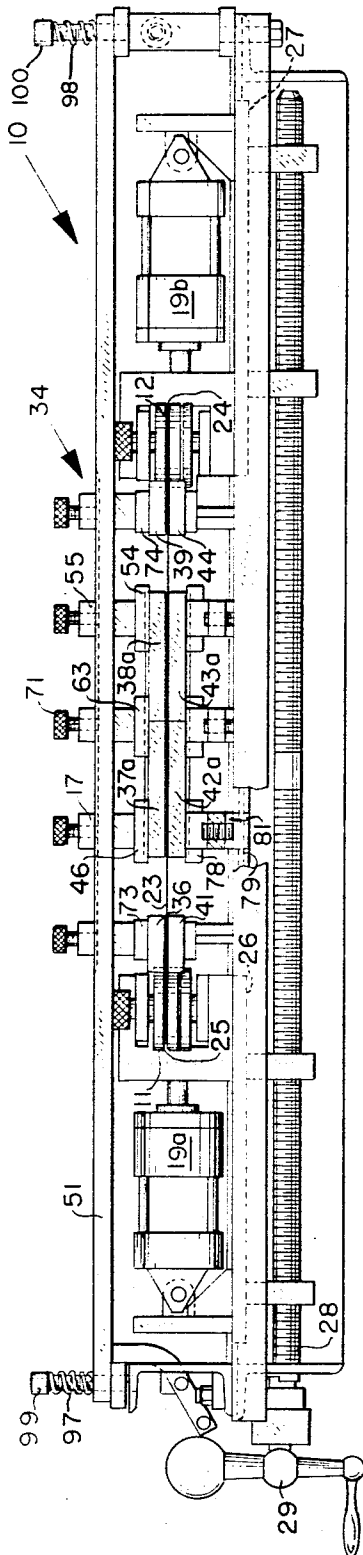


Fig. 1

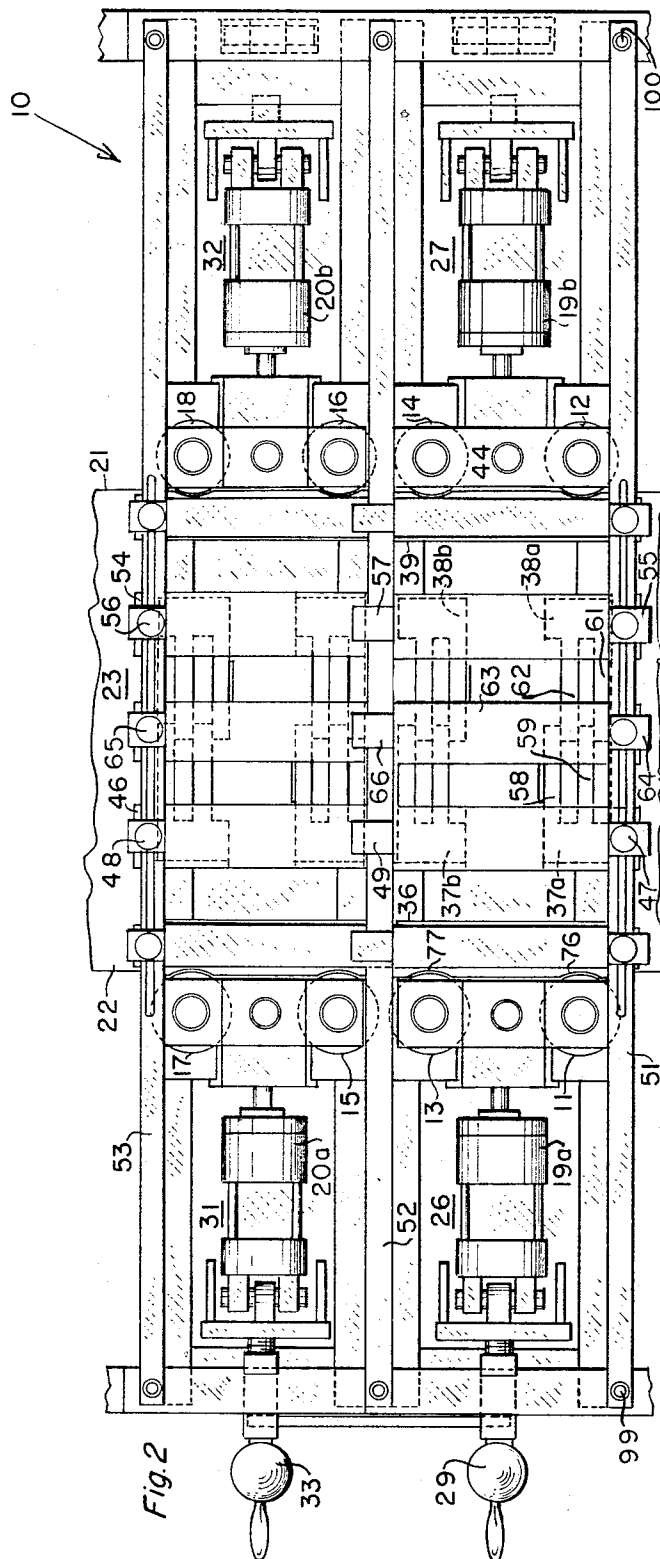


Fig. 2

July 11, 1967

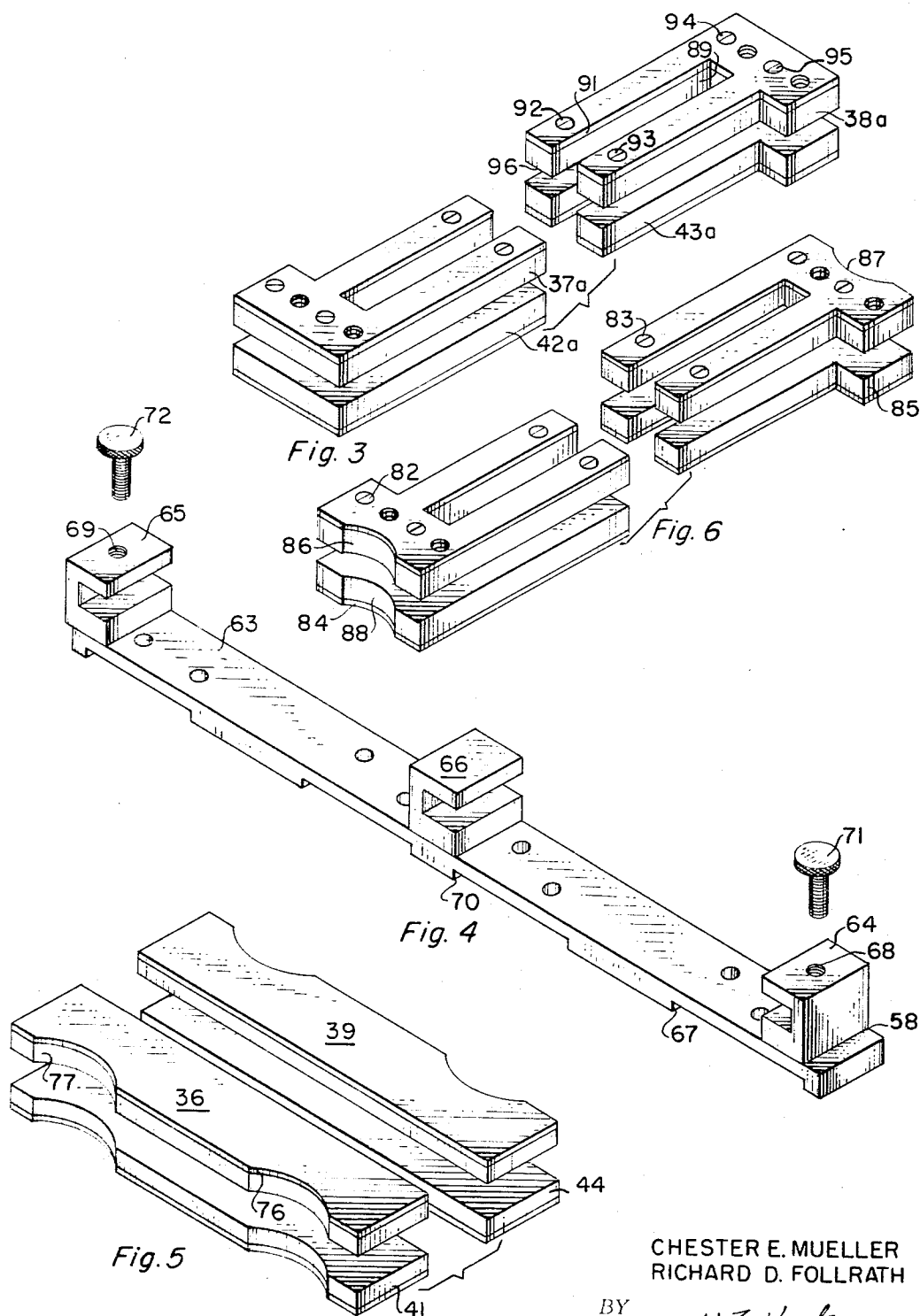
C. E. MUELLER ET AL

3,330,144

SHOE FOR USE WITH EDGE ROLLING APPARATUS

Filed Nov. 25, 1964

2 Sheets-Sheet 2



CHESTER E. MUELLER
RICHARD D. FOLLRATH

BY

V F Voeks

THEIR AGENT

1

3,330,144 SHOE FOR USE WITH EDGE ROLLING APPARATUS

Chester E. Mueller and Richard D. Follrath, Muskegon,
Mich., assignors to Anaconda Wire and Cable Com-
pany, a corporation of Delaware

Filed Nov. 25, 1964, Ser. No. 413,840

9 Claims. (Cl. 72-250)

ABSTRACT OF THE DISCLOSURE

An edge rolling apparatus for metal strip comprises flattening blocks that are cut out to fit closely to the rolls. A plurality of such blocks are shaped to adjustably intermesh with each other.

Our invention relates to a flattening shoe for use in edge rolling metal strip and particularly to such a shoe for strip having a very high ratio of width to thickness.

In application Ser. No. 373,159 by one of the applicants in the present case there is disclosed apparatus for edge rolling metal strip to be used in the manufacture of magnet strip. Such strip is usually characterized by a very high width to thickness ratio which makes it susceptible to buckling under the pressure of the rolls in any known type of edge-rolling apparatus. This is particularly true in view of the physical nature of electrical strip which must have high electrical conductivity and is most commonly made from aluminum or copper, the latter being, in many instances, soft.

When strip is edge-rolled it is passed horizontally between pairs of rolls mounted on vertical axes, and it has been known to prevent buckling of the strip by mounting pairs of horizontal rolls so that the strip passes horizontally between them. This structure is satisfactory for heavy-gage steel strip but for relatively thin strip of a metal having less inherent stiffness, the line contact afforded by horizontal rolls is not sufficient to prevent transverse buckling and rippling of the strip. It is a problem, too, in edge-rolling magnet strip that the horizontal confinement of the strip must extend in very close proximity to the edge rolls themselves, since even a short unsupported span is subject to buckling when the material is very thin, and in this regard it should be considered that magnet strip to which our invention is largely directed may have a thickness of only 8 mils, and even less.

We propose by our invention to edge-roll metal strip of extreme width to thickness ratio without warping or buckling.

We propose by our invention to be able to edge-roll thin strips of soft metals such as copper and aluminum.

We further propose by our invention to be able to flatten strips of different widths during the edge-rolling operation.

We have invented a shoe for an edging machine of the type where a thin strip is advanced between edge rolls that compress the strip laterally. Our shoe comprises a plurality of upper blocks with smooth coplanar lower surfaces and a plurality of lower blocks with smooth coplanar upper surfaces. There are means mounting the blocks against the upper and lower surfaces of the strip between the edge rolls and means yieldingly urging the upper and lower blocks together. Both the upper and lower blocks comprise two outer members with curvilinear depressions that fit around the edging rolls and also comprise two intermediate members. The intermediate members have intermeshing fingers and the blocks are laterally adjustable so that the shoe can accommodate strips of different widths which require different spacings

2

of the rolls. Our apparatus also comprises means that lock the block members in spaced relation to each other and to the rolls. Preferably the block surface in contact with the strip are a synthetic resin such as nylon.

A more thorough understanding of our invention may be gained by studying the appended drawing.

In the drawing:

FIGURE 1 shows a side elevation of an edge-rolling machine incorporating our invention.

FIGURE 2 shows a plan view of the machine of FIGURE 1.

FIGURE 3 shows a perspective view of a set of blocks used in our invention.

FIGURE 4 shows a perspective view of a pressure plate used in our invention.

FIGURE 5 shows a perspective view of another set of blocks used in our invention.

FIGURE 6 shows a perspective view of still another set of blocks used in our invention.

In a machine, indicated generally by the numeral 10, a plurality of edging rolls 11, 12, 13, 14, 15, 16, 17, 18 are urged toward each other by hydraulic rams 19a, 19b, 20a, 20b so that they press against edges 21, 22 of a metal strip 23 with the edges 21, 22 entering respective grooves 24, 25 in the rolls 12, 11, and corresponding grooves in the remaining rolls 13-18. The rolls 11, 13 and associated ram 19a are mounted on a platform 26; the rolls 12, 14 and ram 19b are mounted on a platform 27. The rolls 11-14 and their platforms can be adjusted relative to each other by means of a threaded shaft 28 and hand crank 29. Similarly platforms 31, 32 mounting the remaining rolls can be adjusted by means of a crank 33. It is apparent that the pressure created by the rams 19a, 19b, 20a and 20b against the edges 21, 22 will tend to buckle the strip 23, and to prevent this buckling we have provided a shoe indicated generally by the numeral 34. In the embodiment of FIGURES 1 and 2 the shoe 34 comprises upper blocks 36, 37a, 37b, 38a, 38b, 39 and lower blocks 41, 42a, 43a, and 44 to support the strip between the rolls 11, 13 and 12, 14. There is a similar shoe between each double pair of rolls. The blocks 37a, b are screwed to a mounting 46 which is adjustably clamped by means of clamps 47, 48 and slide block 49 to rails 51, 52, 53. Similarly the blocks 38a, b are screwed to a mounting 54 which is held to the rails 51-53 by clamps 55, 56, and a slide block 57. The block 37a has fingers 58, 59 extending to the right as seen in FIGURE 2 and the block 38a has fingers 61, 62, extending to the left and so dimensioned and positioned that they alternate with the fingers 58, 59 and the two pairs of fingers slide past each other in such a manner that the width of the surface presented by the combined blocks 37a, 38a can be adjusted to meet the requirements of the particular size of strip being processed in our apparatus.

In the area where the fingers 58, 59 and 61, 62 slide past each other the blocks 37a, 38a are held down by a pressure plate 63 clamped similarly to the mountings 46, 54, to the rails 51-53 by clamps 64, 65 and a slide block 66. The plate 63 has flat channels which can best be seen in FIGURE 4. These channels are just large enough to provide a slide fit for the intermeshed fingers of the blocks, a channel 67 fitting the blocks 37a, 38a and a channel 70 fitting the pair of blocks 37b, 38b. Other blocks can be seen in FIGURE 2 and, generally speaking, for each opposing pair of rolls such as the rolls 11, 12 there is a pair of blocks with intermeshing fingers and a channel such as the channel 67 in a pressure plate such as the plate 63. The pressure plate 63 and similar plates in our apparatus and the mountings such as the mountings 46, 54 are clamped to the outside rails 51, 53 by clamps such as the clamps 64, 65 and are held to the

inside rail 52 by slide blocks. The clamps differ from slide blocks by having tapped holes such as holes 68, 69 in the clamps 64, 65 (FIGURE 4) for knurl headed set screws 71, 72. The edges of the strip are prevented from buckling by the blocks 36, 39, screwed to respective mountings 73, 74 attached to the rails 51, 52, 53 in a manner similar to the mountings hereinbefore described. In order to support the strip fully in the neighborhood of the rolls 11, 13 the block 36 is cut away to form curvilinear depressions 76, 77 (FIGURE 5) which curve around an arc of the rolls during the operation of our apparatus. The upper block 36 is matched by a lower block 41, the upper block 37a has a matching lower block 42a, block 37b is matched by a similar lower block not shown, block 38a is matched by block 43a, block 38b is also matched by a similar lower block not shown, and block 39 is matched by a lower block 44. The lower blocks are screwed to mountings and slide in grooved pressure plates in a manner analogous to the upper blocks. Thus the block 42a is screwed to a mounting 78 which is adjustably attached to a rail 79 by a slide lock 81. The mounting 78 is also attached by similar means to lower rails corresponding to the upper rails 52, 53 and directly beneath them, but not shown in the drawing.

Although FIGURE 2 of the drawing shows an apparatus with four pairs of rolls it will be understood that a greater or lesser number may be used within the scope of our invention with the provision that smooth-surface blocks comprising elements of the shoe of our invention shall flatten the strip between each pair of rolls, as hereinabove explained.

In FIGURE 6 a set of blocks 82, 83, 84, 85 is shown suitable for use on narrower strip and characterized by having curvilinear depressions 86, 87, 88 and a similar depression in the block 85, cut directly in the same blocks that have the intermeshing fingers. Use of the blocks 82-85 eliminates the need for separate blocks 36, 39 and the blocks 82-85 are mounted in a manner entirely analogous to the mounting of the blocks 37a, 38a, 42a, 43a hereinabove described.

As can best be seen by reference to FIGURE 3 each block, such as the block 38a, is comprised of a thick nylon strip-contacting member 89 fastened to a steel plate member 91 by means of screws 92, 93, 94, 95. The nylon has a long-wearing, low-friction surface 96 that is particularly useful in the practice of our invention but other synthetic surfaces may also be used such as Teflon and polyethylene within the scope of our invention.

To permit the blocks to yield when irregularities or splices pass through our apparatus, the rails 51, 52, 53 are mounted against compression springs, such as springs 97, 98 (FIGURE 1) held by headed pins 99, 100.

We have invented a new and useful apparatus for which we desire an award of Letters Patent.

We claim:

1. In an edging machine of the type wherein a fine-gage metal strip having a high width-to-thickness ratio is advanced in lateral compression between opposingly spaced edge rolls, an adjustable flattening shoe comprising:

- (A) a plurality of upper blocks having smooth coplanar lower surfaces,
- (B) a plurality of lower blocks having smooth coplanar upper surfaces,
- (C) means mounting said upper and lower blocks respectively against the upper and lower surfaces of said strip between said edge rolls,
- (D) means yieldingly urging said upper and said lower blocks together,
- (E) said plurality of upper blocks and said plurality

of lower blocks each comprising two members having curvilinear depressions fitting around said rolls, (F) said blocks being laterally adjustable, thereby accommodating strips of different width and different roll spacings.

2. The shoe of claim 1 wherein said surfaces are synthetic resin.

3. The shoe of claim 1 wherein said surfaces are nylon.

4. In an edging machine of the type wherein a fine-gage metal strip having a high width-to-thickness ratio is advanced in lateral compression between opposingly spaced edge rolls, an adjustable flattening shoe comprising:

- (A) a plurality of upper blocks having smooth coplanar lower surfaces,
- (B) a plurality of lower blocks having smooth coplanar upper surfaces,
- (C) means mounting said upper and lower blocks respectively against the upper and lower surfaces of said strip between said edge rolls,
- (D) means yieldingly urging said upper and said lower blocks together,
- (E) said plurality of upper blocks and said plurality of lower blocks each comprising two outer members defining curvilinear depressions fitting around said rolls,
- (F) said plurality of upper blocks and said plurality of lower blocks each comprising two intermediate members spaced between said outer member,
- (G) a plurality of fingers extending from each of said two intermediate members,
 - (a) said fingers on one of said two members alternating with said fingers on the other of said two members and intermeshing therewith,
- (H) said blocks being laterally adjustable, thereby accommodating strips of different width and different roll spacings,
- (I) means locking said members in spaced relation to each other and to said rolls.

5. The shoe of claim 4 wherein said surfaces are synthetic resin.

6. The shoe of claim 4 wherein said surfaces are nylon.

7. In an edging machine of the type wherein a fine-gage metal strip having a high width-to-thickness ratio is advanced in lateral compression between opposingly spaced edge rolls, an adjustable flattening shoe comprising:

- (A) two upper blocks having smooth coplanar lower surfaces,
- (B) two lower blocks having smooth coplanar upper surfaces,
- (C) each of said blocks defining curvilinear depressions fitting around said rolls, and
- (D) each of said blocks comprising a plurality of fingers intermeshing with fingers of another of said blocks,
- (E) said blocks being laterally adjustable thereby accommodating strips of different width and different roll spacings,
- (F) means locking said blocks in spaced relation to each other and to said rolls.

8. The shoe of claim 7 wherein said surfaces are synthetic resin.

9. The shoe of claim 7 wherein said surfaces are nylon.

References Cited

UNITED STATES PATENTS

2,184,582 12/1939 Cook ----- 72-250

FRANCIS S. HUSAR, *Primary Examiner.*