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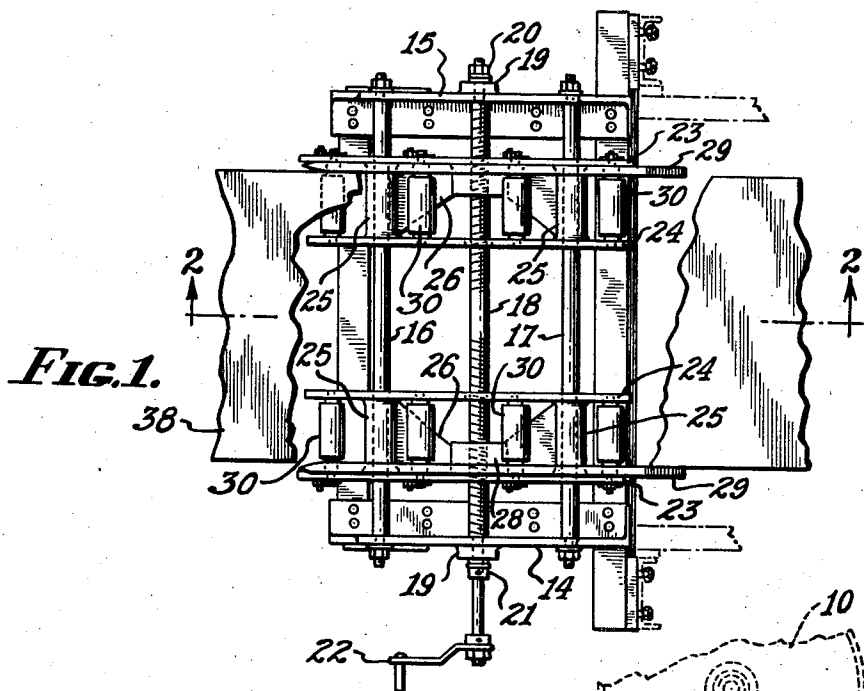
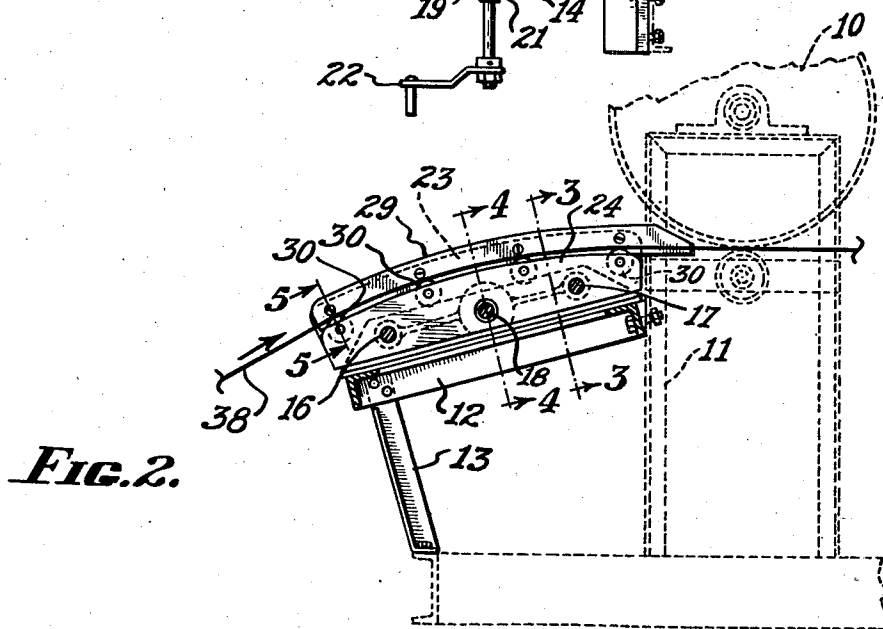
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2,365,322

GUIDE

Filed Dec. 1, 1941

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

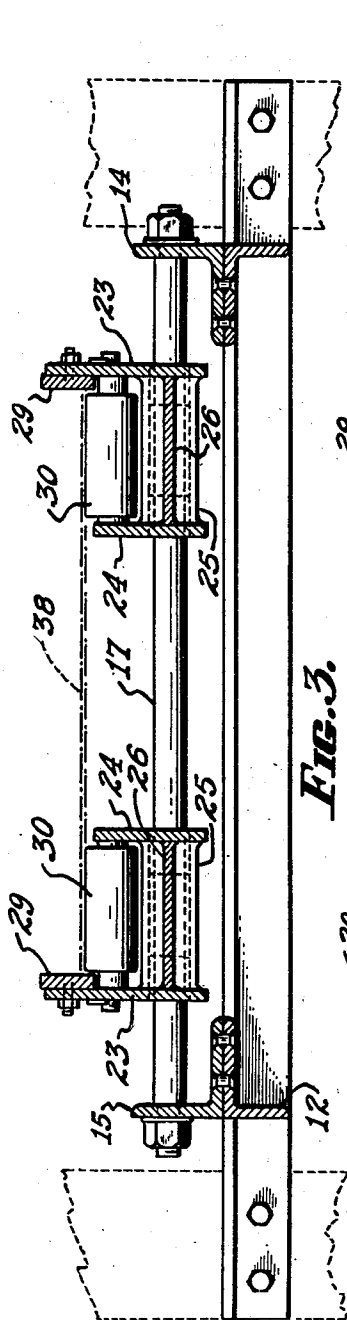


FIG. 3.

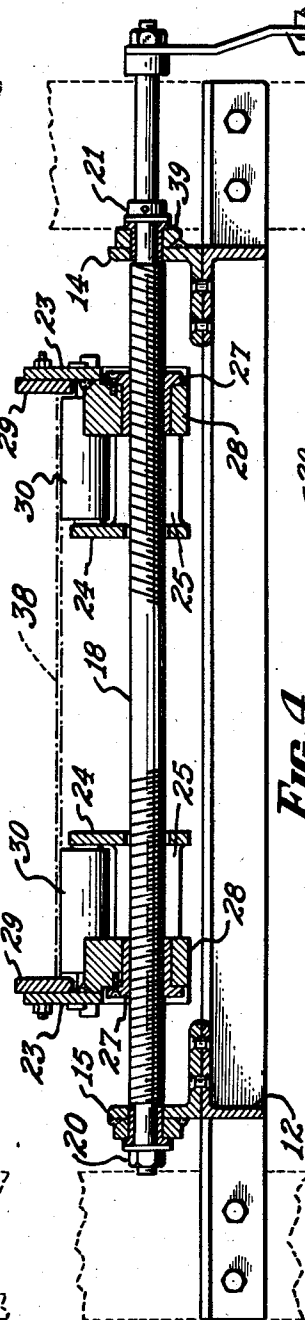


FIG. 4.

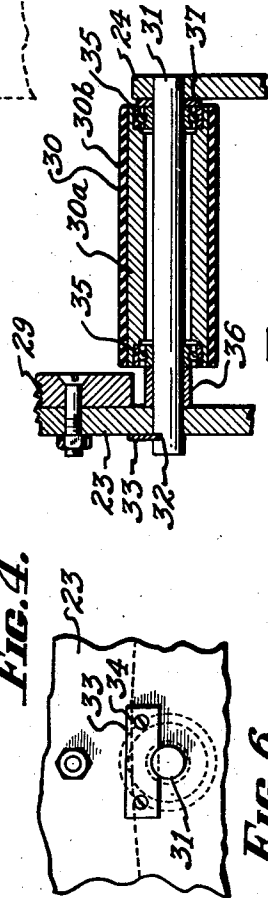


FIG. 5.

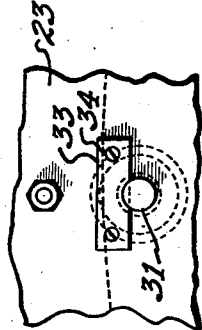


FIG. 6.

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UNITED STATES PATENT OFFICE

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GUIDE

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7 Claims. (Cl. 271—2.6)

My invention is addressed to the problem of providing guide means for sheet material and in particular, sheet material of a character difficult to guide. Among such materials I may mention strip steel or strips of other metals which lack flatness but are characterized by a wavy or cambered formation, strips formed from individual pieces of lesser length by lapping and welding or stitching, strips of coated material where the coating is of delicate character, for example, strips of silicon steel or other metals coated with a separator substance for annealing, such as magnesium hydroxide, and strip metal which has been coated with a molten metal, for example, zinc, terne metal, aluminum and the like.

Heretofore various attempts have been made to guide such materials into or out of stations where operations are performed on them such, for example, as shearing, slitting, welding, stitching, coiling and decoiling and the like, as well as rolling operations. The standard guide means heretofore employed is a guide box having top and bottom boards overlying and underlying the strip, and side guide means which are usually in the form of bronze T-guide bars. Such guide boxes cannot be used at all on lapped and welded or stitched strip. Neither can they be used on many coated strips such as strips coated with a separator, aluminum coated strips and the like. The bronze T-bars cut out or wear away rapidly, and the construction of such guide boxes is not advantageous from the standpoint of the time required to change over from one width of strip to another.

Another type of guide means which has been proposed and used to some extent comprises a series of spaced, staggered rolls, the strip passing over one set of the rolls and beneath another set, similar to the manner in which a strip passes through the familiar roller leveler. The rolls had to be arranged in such a manner that each succeeding roll deflected the strip slightly from the path it was following just before it reached that roll. Near the ends of the rolls, hardened steel guides were employed, cut out for clearance to accept the rolls. These guides were made adjustable in width, and the change-over time could in this way be cut down. But the structure was expensive and had certain disadvantages. It was hard on coatings imposed on metal strip. It could not be used with good effect on strip coated with a separator substance and it tended to scratch or mar metal coatings. Zinc or aluminum would build up between the guide bars and the rolls where it was difficult to clean. The

coatings tended to be scratched off in places and metal slivers or shavings tended to accumulate in the apparatus, and on the strip. Moreover, by reason of the roller leveling action and the repeated deflection of the strip, the guide had a tendency to cold work the material. With some metal strips such cold work would not be of great significance; but in finished silicon steels, by way of example, it tended to impair the magnetic properties and raise the core loss of the material in an important degree, and in such a way that the qualities of the metal could not subsequently be restored by strain annealing treatments.

The object of the present invention is to provide a guide means suitable for the guiding not only of flat and true strip but also of all of the different kinds of strip mentioned above. It is an object of the invention to provide a structure which will not mar the surfaces of strip nor displace, scratch or remove coatings on the surfaces, even where those coatings are of delicate character as in strip materials bearing a coating of separator substance and being coiled for annealing. It is an object of my invention to provide a coiling means which is effective not only for flat strip with true edges, but also for strip characterized by waviness and camber, and for strip having lapped and stitched or welded joints. It is an object of my invention to provide a guide means which is cheaper and less expensive than the guide means hitherto known in the art. It is an object of my invention to provide a guide means in which no hold-down structures are necessary, in which one surface of the strip need not be contacted at all as the strip passes through the guide means, and in which the opposite side of the strip is contacted only by supporting means having essentially antifriction contact. It is an object of my invention to provide a guide in which the strip is so disposed that in spite of camber, waviness, the presence of lapped and stitched or welded joints, and the like, simple side guide means will be found sufficient to enforce the desired path of travel of the material. It is an object of my invention to provide a guide means which does not work the material in any sense, and which, used in conjunction with coiling or decoiling means, or slitting or cutting means, does not operate to reverse any coil set previously formed in the material, but may be employed to enforce the carrying on of operations on the strip in such a way as not to reverse the coil set. Thus it is an object of my invention to provide a guide means which will not impair the magnetic or core loss characteristics of electrical strip

material. It is an object of my invention to provide a guide means which is suitable for the handling of brittle materials such as high silicon steel.

These and other objects of my invention which will be set forth hereinafter or will be apparent to one skilled in the art upon reading these specifications, I accomplish by that certain arrangement of parts of which I shall now describe a preferred embodiment. Reference is made to the drawings wherein:

Figure 1 is a plan view of my guide means in its exemplary form.

Figure 2 is a vertical section taken along the line 2—2 of Figure 1.

Figure 3 is a transverse, vertical section taken along the line 3—3 of Figure 2.

Figure 4 is a transverse, vertical section taken along the line 4—4 of Figure 2.

Figure 5 is a vertical section through one of the supporting rollers used in connection with my guide.

Figure 6 is a partial elevational view of a portion of the guide showing a mode of mounting one of the supporting rollers.

Briefly in the practice of my invention, I provide a frame or mounting means and a pair of side abutments, which are mounted on the frame preferably in such a manner as to be adjustable toward and away from each other. In connection with each such side abutment, I provide a series of supporting rollers mounted for movement in connection therewith and adapted to support the strip by a guide. The side abutments are slightly arcuate in form and the rollers are so arranged as to support the strip being guided in an arcuate path of gentle curvature. This eliminates the necessity of any hold-down means and makes it possible for me to operate my guide without any elements contacting the top surface of the strip material as it passes therethrough. Also, in spite of waviness or camber in the strip material and in spite of joints of such character as to prevent the passage of the jointed strip through ordinary guide means, my structure imparts sufficient lateral rigidity to the strip to make possible the mere use of the side abutments heretofore mentioned and the use of these abutments in such a way that they do not exert undue pressure on the side edges of the strip. Thus not only is wear on the guide means themselves greatly cut down, but the chances of marring or scratching the strip, or of removing surface coatings thereon or of shredding portions of the strip or of the coatings are greatly minimized.

Referring to Figs. 1 and 2, I have indicated diagrammatically at 10 an apparatus for operating on the strip. The nature of this apparatus is not a limitation on my present invention. It may be a coiler, a de-coiler, a slitter, a side-edge trimmer, a means for de-coating or coating the strip with a separator substance, any of the apparatus of an assembly of means for cleaning, annealing, pickling or coating the strip with molten metal, or other apparatus, and the skilled worker in the art will understand that any guide means may be located either on the entrance side of such apparatus or on the delivery side thereof, or both. My guide means is small in extent, and while it may be separately mounted upon a floor if desired, it will in many instances be mounted on and at least partially supported by the frame of the apparatus to which or from which it operates to guide the strip material. The diagrammatic operating means indicated in Fig. 2 is shown as

having a frame 11 to which the main frame 12 of my guide means is bolted. The frame 12 may have a support 13 for its free end, and this support may be attached to the foundation of the machine or to the floor as desired. The frame 12 and supporting element or elements 13 are preferably made of angle irons or other suitable structural elements which may be bolted, riveted or welded together as desired. At each side of the frame I provide members 14 and 15 having upstanding portions which will serve as mountings for the elements next to be described.

These elements include two or more shaft-like supports 16 and 17 extending across between the members 14 and 15. On these supports the abutments and rolls are slidably mounted, as will hereinafter be described.

Also the members 14 and 15 are employed to serve as bearings for a shaft 18 having right and left hand threads. To this end, bearing hubs 19 may be formed upon or welded to the members 14 and 15. The threaded shaft 18 is rotatably journaled in these hubs 19 and bushings 39, and is restrained from endwise movement by suitable means such as the washer and nut 20 at the one end and the washer and collar 21 at the other. A prolongation of the shaft 18 will bear some means whereby the shaft may be turned for adjustment. I have indicated a handle 22, but other means may be employed such as a hand-wheel or a source of power, for example an electric motor and suitable controls.

The side abutment and roller assemblies may, if desired, be comprised of cast structures, or they may be fabricated from suitable individual metal pieces. In any event, in their preferred form, they comprise an outer vertically extending rib 23 and an inner vertically extending rib 24. These ribs are connected by spacers 25 which are hollow and are slidably mounted on the supporting rods 16 and 17. In order to reinforce and strengthen the structure these spacers may be connected by webs 26. Nuts 27, having respectively right and left hand threads engage the threaded portions of the shaft 18 and are non-rotatably fastened to the ribs 23. This may be done directly or through the intermediary of nut holding blocks 28 formed integral with or fastened to the ribs 23. It will be evident from the structure thus far described that as the shaft 18 is rotated by the handle 22 or other suitable means the structures comprising the ribs 23 and 24 will be moved toward or away from each other for adjustment to various strip widths. The actual members serving as side abutments for the strip edges are preferably made removable and renewable for the reason that they will be subjected to some wear. Hence, I prefer to make them in the form of ribs 29 which may be bolted or otherwise fastened to the ribs 23. The abutment ribs 29 may be made of any suitable substance such as hardened steel, bronze or even wood or fiber.

Supporting rollers for the strip material are detailed in Fig. 5. They are short rollers lying between ribs 23 and 24 and indicated generally by the numeral 30. I prefer to support these rollers on shafts 31 extending through perforations in ribs 23 and 24. These shafts may be non-rotatable and may be simply held in position by grooving or notching an end of the shaft as at 32, and causing a keeper plate 33 to engage in the groove or notch and to be fastened as by screws or bolts 34 to the rib 23. The shaft 31

may bear a pair of ball or roller bearings 35, the outer races of which engage the body 30a of the supporting rolls. The bearings may be located on the shaft by means of collars or washers 36 and 37. Where the strip material has a delicate surface or is coated with some easily displaceable material, I may cover the bodies of my supporting rollers with a rubber, fiber or cloth layer 30b, or a layer of some other substance suitable for the purpose.

Referring particularly to Fig. 2, it will be noted that the side abutment structures including the ribs 23 and 24 are of curved outer construction, and that the several rollers 30 are located in a slightly arcuate plane. The strip 38 as it passes over the guide, resting upon the rollers 30 thus assumes a slightly arcuate configuration. Even though the strip may be characterized by great waviness, the following of this slight arcuate path makes it certain that the side edges of the strip will always lie between the side abutments 29, which abutments therefore are enabled to enforce the desired path of travel of the strip material as it passes through the guide. Yet in my construction there is nothing contacting the strip 38 from above, while below the strip merely rests upon the rolls 30 which may as indicated, be covered with some non-marring substance. Moreover, the rolls 30 have, preferably, anti-frictional mountings so that they have no tendency to scratch the under surface of the strip or any coating imposed thereon. It will be noted from a consideration of Figs. 3 to 5 inclusive, that the side guides 29 are interspaced from the ends of the rollers 30 so that my guide means has no tendency to become clogged with slivers, metal dust or other substances worn away from the actual edges of the strip material. The curvature indicated by the rollers 30 is a gentle curvature, preferably only sufficient to impart transverse stiffness to the strip material being guided. It is not sufficient to impart any cold work to the strip nor is it sufficient to reverse any coil set which has theretofore been imparted to the strip material. Indeed, my guides may be so used that the curvature imparted by the guiding means is in the same direction as any previous coil set, so that the use of my guiding means prevents a reversal of the coil set and prevents any sharp, angular bend in the material. The extent of the curvature of the arcuate path of my guide is preferably insufficient to overcome the elasticity of the strip being guided, and insufficient to impart any permanent set of any kind to the strip.

Modifications may be made in my invention without departing from the spirit of it. Having thus described my invention in an exemplary embodiment, the features of patentable novelty therein are set forth in the appended claims. Therefore, having thus described my invention in an exemplary embodiment, what I claim as new and desire to secure by Letters Patent, is:

1. In a guide, a frame, two series of spaced rollers for supporting a strip from underneath, said rollers in each series arranged to cause said strip by gravity to follow a path which is sufficiently arcuate to give transverse stiffness to said strip, and a side abutment for each said series arranged to be associated with the side edge of a strip as so supported, and means to support each said side abutment at a position spaced outwardly from the ends of the rollers in its series, said means to support said abutment also comprising means to support the rollers in its series, each said abutments, the rollers in its series, and

said supporting means being movable as a unit with respect to said frame.

2. In a guide, a frame and a path-defining means mounted on said frame comprising a series of spaced rollers for supporting a strip from underneath, said rollers arranged to cause said strip by gravity to follow a path which is slightly arcuate, and a side abutment arranged to be associated with the side edge of a strip as so supported, within the extent of said arcuate path, and means to support said side abutment at a position spaced outwardly from the ends of said rollers, said means to support said abutment also comprising means to support said rollers, said abutment, said rollers and said supporting means being movable as a unit with respect to said frame, means on said frame for mounting said unit so as to be movable transversely of said frame, and means for adjusting the position of said unit with respect to said frame.

3. In a guide, a frame, a pair of sub-frames mounted so as to be transversely movable with respect to said frames, each of said sub-frames comprising a series of spaced rollers located so as to support strip material from beneath and to cause it by gravity to follow a slightly arcuate path, each of said frames also comprising side abutment means associated with said rollers, and means for moving said sub-frames toward and away from each other.

4. In a guide, a frame, means providing ways extending across said frame, a sub-frame mounted on said ways, means to adjust the position of said sub-frame on said ways, a series of spaced rollers mounted on said sub-frame and adapted to support strip material from underneath and to cause it by gravity to follow a slightly arcuate path, and a side abutment means attached to said sub-frame and arranged to lie adjacent the side edge of strip material passing over said rollers in the extent of said arcuate path.

5. In a guide, a frame, means providing ways extending transversely of said frame, a pair of sub-frames mounted on said ways, means for adjusting the position of said sub-frames relatively to each other, each of said sub-frames comprising spaced rib members and means connecting said rib members together, a series of rollers in each frame located between said spaced rib members, and arranged to support strip material from underneath and to cause it by gravity to follow a slightly arcuate path, one rib member of each of said sub-frames bearing a side abutment means arranged to lie adjacent an edge of strip material passing over said rollers.

6. In a guide, a frame, means providing ways extending transversely of said frame, a pair of sub-frames mounted on said ways, means for adjusting the position of said sub-frames relatively to each other, each of said sub-frames comprising spaced rib members and means connecting said rib members together, a series of rollers in each sub-frame located between said spaced rib members, and arranged to support strip material from underneath and to cause it by gravity to follow a slightly arcuate path, one rib member of each of said sub-frames bearing a side abutment means arranged to lie adjacent an edge of strip material passing over said rollers, said means for adjusting the position of said sub-frames comprising a shaft with right and left hand threads, said shaft being journaled on said frame and engaging non-rotatable nuts in each of said sub-frames, together with means for rotating said shaft.

7. In a guide structure for strip metal, a base, a frame slidable on said base transverse to the direction of motion of strip metal thereover, a series of spaced rollers mounted on said frame for supporting a strip from underneath, the axes of said rollers lying in directions transverse the said movement of strip metal and said rollers arranged to cause the strip metal to follow a path sufficiently arcuate to give transverse stiffness to said

strip metal, a side abutment arranged to be associated with the side edge of strip metal passing over said rollers, mounted on said movable frame off the ends of said rollers, means to adjust the position of said frame on said base, and a second and opposite side abutment supported by said base.

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