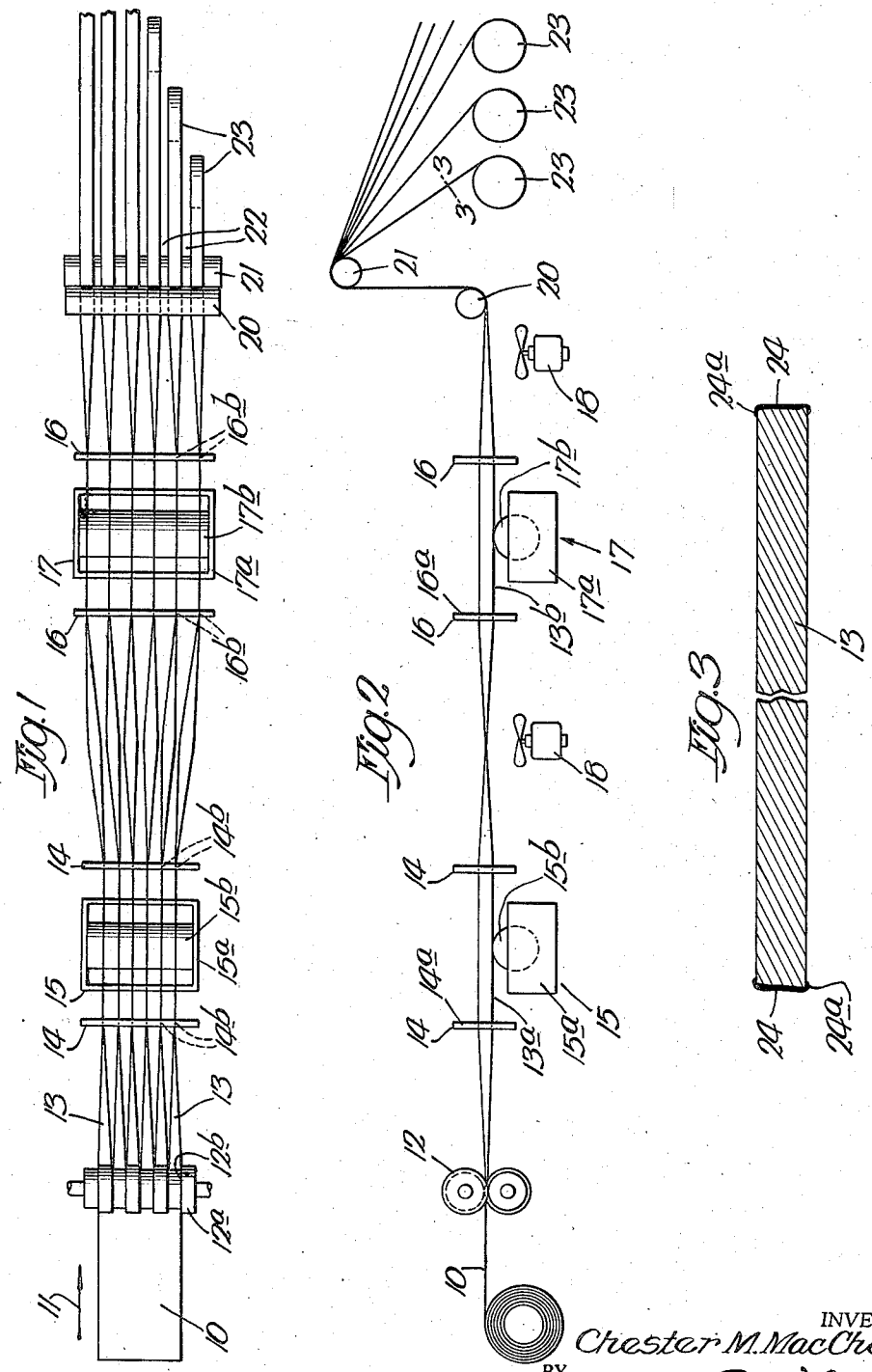
Oct. 10, 1944. C. M. MacCHESNEY 2,360,247

APPARATUS FOR FORMING STRIP METAL PRODUCT

Filed May 23, 1941



INVENTOR.
Chester M. MacChesney
BY
Davis, Lindsey, Smith & Shrouts,
Attys.

Patented Oct. 10, 1944 2,360,247

UNITED STATES PATENT OFFICE

2,360,247

APPARATUS FOR FORMING STRIP METAL PRODUCTS

Chester M. MacChesney, Chicago, Ill., assignor to Acme Steel Company, Chicago, Ill., a corporation of Illinois

Application May 23, 1941, Serial No. 394,759

2 Claims. (Cl. 91—14)

This invention relates to improvements in apparatus for forming strip steel or other strip material.

Flexible binding straps, commonly known as steel strapping, which are employed for binding and reinforcing boxes and packages preliminary to shipment, have heretofore been produced by the longitudinal slitting of comparatively wide metal sheets or strips, thereby forming strips of the desired narrow width suitable for binding purposes. The narrow strip material thus produced usually has rough unprotected edges which are liable to cause injury to the workman and to the boxes or packages reinforced thereby and this rough edged material is also likely to become rusty or corroded upon exposure to the weather unless precautions are taken to remove the rough edges and to apply protective coatings. Heretofore, there has been no satisfactory economical method of removing the roughness of the edges of the strips thus formed and, in order to protect the edges from the weather, it has been necessary to enamel or galvanize the entire strip.

According to the present invention the roughened edges of the narrow strips, produced by the slitting of a wide sheet or strip, are coated on their edges only while in motion with a coating material of sufficient thickness to cover all of the more or less minute projections on the edges of the strip and to protect these edges against rust and corrosion. The material used in coating the edges of the strips may preferably be ethyl cellulose or other plastic material having the quality of adhering readily to the edges of the strip upon contact therewith and capable, also, of drying and hardening readily upon contact with the surrounding air, but the edges may be coated with enamel or the like which may be hardened by passing the strips through a baking oven as they are produced. According to the preferred practice of the invention, the narrow strips formed by the longitudinal slitting of a comparatively wide sheet or strip are turned or twisted laterally as they are formed and while they are in motion so that they may be presented edgewise to a coating device adapted to apply a protective coating to one edge of each strip, whereupon each strip is twisted through an angle of substantially 180 degrees so that the opposite edges of the strips may then be presented to another coating device adapted to coat these opposite edges. In this way, the edges of each narrow strip are coated in succession while the strips are in motion and as they are produced by a material which is preferably capable of hardening and drying readily so that the narrow strips may then be wound upon reels in readiness for the market. Other objects of the invention relate to various features of the process and apparatus and to the details of the improved product which will appear more fully hereinafter.

The nature of the invention will be understood from the following specification taken with the accompanying drawing in which one example of the improved method and apparatus, and a modification thereof, are somewhat diagrammatically illustrated in connection with one form of the improved product. In the drawing:

Figure 1 is a diagrammatic top plan view of apparatus adapted for use in forming a coated metal strip;

Fig. 2 shows a side elevation of the apparatus illustrated in Fig. 1; and

Fig. 3 shows an enlarged section taken on the line 3—3 of Fig. 2, illustrating the final product with the coating applied to the edges thereof.

In practicing the invention in accordance with the improved apparatus illustrated in the drawing, a comparatively wide sheet or strip 10 of steel or other suitable metal is moved longitudinally in the direction of the arrow 11 between a pair of complementary slitting rolls 12 which are provided with annular projections 12a and intermediate annular depressions 12b arranged alternately on the opposite rolls and adapted to intermesh with each other, with their edges in proximity to each other in radial planes so that the edges of the annular projections function as shearing dies to slit the sheet or strip 10 longitudinally and thus form a plurality of narrow strips 13. In order that these parallel moving strips 13 may be presented edgewise to the liquid coating material which is to be applied thereto, they are caused to be twisted or turned through angles of 90 degrees by a pair of twisting guides 14 which may be in the form of vertical plates 14a having a plurality of parallel vertical slots 14b formed therein so that the strips 13 are caused to twist longitudinally and occupy vertical planes in the region between the two guides 14.

While the strips 13 are passing between the two guides 14, their lower edges are adapted to be coated with a coating material applied by a coating device 15 comprising a vessel 15a containing the coating liquid which may be ethyl cellulose, enamel or other material, preferably plastic, adapted for the purpose. If the coating material is ethyl cellulose or the like, it may pref-

erably be maintained in a hot condition in the vessel 15ᵃ but when enamel is applied as the coating material it may be applied at room temperature. In the vessel 15ᵃ there is mounted a cylindrical roller 15ᵇ, the peripheral surface of which is adapted to contact with the lower edges 13ᵃ of all of the strips 13. The roller 15ᵇ may be power driven but the frictional contact of the advancing strips 13 will ordinarily be sufficient to rotate the roller 15ᵇ and cause it to carry up out of the vessel 15ᵃ a quantity of the coating liquid which is thereby applied to the lower edges of the strips.

After passing through the second guide 14, each strip 13 is rotated through 180 degrees and passed through a second pair of guides 16 which are similar in construction to the guides 14, each comprising a vertical plate 16ᵃ provided with parallel vertical slots 16ᵇ through which the strips 13 pass after being rotated laterally through 180 degrees so that the edges 13ᵇ which were directed upwardly during the first coating operation are now directed downwardly to contact with the roller 17ᵇ of a second coating device 17. The coating device 17 is similar to the device 15 and comprises a tank or vessel 17ᵃ in which a supply of the coating liquid is maintained. As the strips 13 pass in parallel paths over the coating device 17, their lower edges 13ᵇ are coated by contact with the peripheral surface of the cylindrical roller 17ᵇ which may be rotated by a frictional contact with the strips or by the application of power. If the rollers 15ᵇ and 17ᵇ are driven by power, their peripheral surfaces should have the same linear speeds as the speeds of travel of the strips 13.

In the event that the edges of the strips 13 are coated with ethyl cellulose or other plastic material capable of drying readily in the air, it is desirable to mount a fan 18 following each of the coating devices 15 and 17 so that the air may be circulated violently in the region of the coating strips to dry the coating material on the edges thereof. In the event that the edges of the strips 13 are coated with enamel or other material which does not dry quickly and readily in the air, the strips 13 may be caused to pass through a heated oven, so that the enamel may be baked immediately after the strips emerge from the coating device 17.

Whichever method be employed for drying the coating material on the edges of the strips, the strips are carried around a cylindrical roller 20, immediately after the completion of the coating and drying process, and are then directed upwardly and around a second cylindrical roller 21. In the process of passing from the second guide 16 to the cylindrical roll 20, the strips 13 are again rotated through 90 degrees so that as they engage the roll 20 they all lie in the same plane with their edges parallel or substantially parallel to each other. In passing to the roll 20 from the second guide 16, the strips are preferably spread apart slightly so that as they emerge from contact with the upper roll 21 there are spaces 22 between adjacent strips. The strips are then directed downwardly and wound upon separate reels 23 which are power driven so that a motive force is thus applied to the strips for advancing all of these strips and the parent strip 10 through the successive stages of the process. After a suitable quantity of the strip material 13 has been wound upon each of the reels 23, the coil is removed in readiness for the market and the slitting, coating and winding operation is continued.

In Fig. 3, there is illustrated on a large scale a section of the strip material having coatings 24 applied to the edges thereof. These are the coatings applied by the coating devices 15 and 17 and they are of sufficient thickness to enclose all of the minute projections on the edges of the strip and to give these edges a substantially smooth outer surface. The coating material should preferably not have a too great fluidity so that a considerable quantity of this material will be carried on the peripheral surfaces of the rollers 15ᵇ and 17ᵇ and thus cause the coatings 24 to overlap the flat sides of the strips 13 as shown at 24ᵃ in Fig. 3. In this way, the coatings may be made to operate effectively to prevent injury to the strip material by rust or corrosion and also to prevent injury to the hands of the workman and to the surfaces of the boxes or packages which are bound by the strips.

In the claims, the term "sheet" is not necessarily to be construed in the technical sense in which it is commonly employed in this art, since it is intended to include "strips" which, although not of "sheet" width, are wider than the strips into which the supply material is divided by the slitting step.

I claim:

1. The combination in apparatus for forming a strip metal product, of means for slitting a sheet to form a plurality of parallel strips, means for turning said strips about their longitudinal axes and maintaining them with one edge of each strip directed downwardly, means for applying a coating to the downwardly directed edges of said strips, means for then turning each strip about its longitudinal axis to direct its other edge downwardly, and means for coating said other edges of said strip while they are directed downwardly.

2. The combination in apparatus for forming a strip metal product, of means for slitting a sheet to form a plurality of parallel strips, means for turning said strips about their longitudinal axes and maintaining them with one edge of each strip directed downwardly, means for applying a coating to the downwardly directed edges of said strips, means for then turning each strip about its longitudinal axis to direct its other edge downwardly, means for coating said other edges of said strip while they are directed downwardly, means for again turning said strips to restore them to parallel relationship in the same plane, and means for separately winding the individual strips.

CHESTER M. MACCHESNEY.