Sept. 15, 1931. E. DE RIDDER 1,823,489

METHOD OF AND APPARATUS FOR PRODUCING PROFILE STRIPS FROM SHEET MAGNESIUM ALLOYS

Filed Jan. 28, 1928

Fig. 1.

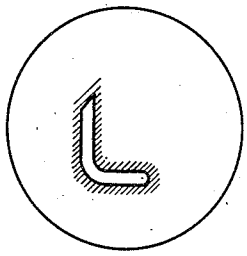


Fig. 2.

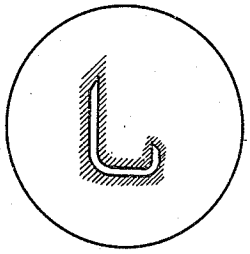
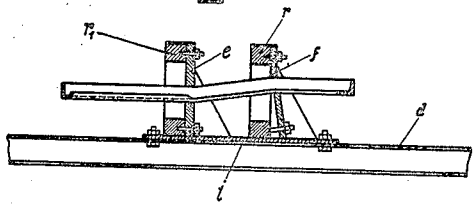


Fig. 3.



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UNITED STATES PATENT OFFICE

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METHOD OF AND APPARATUS FOR PRODUCING PROFILE STRIPS FROM SHEET MAGNESIUM ALLOYS

Application filed January 28, 1928, Serial No. 250,314, and in Germany January 28, 1927.

This invention relates to a method of producing profiled strips from shaped sheets of magnesium alloys. Hitherto such strips were exclusively produced by extruding in presses of known construction. However the manufacture of the required extruding dies for each single sort of profile is very expensive.

I wish to point out, however, that my invention does not involve any marked alteration of the thickness or width of the strips to be shaped, but applies only to the bending, or perhaps more properly expressed, folding of an originally rectilinear cross section in a predetermined uniform manner along the whole length of the strip.

Now I have found that profiled strips up to a thickness of the material of several millimetres may be produced in a far simpler manner from rolled sheet metal strips or extruded strips by drawing, provided certain conditions are observed.

Of these conditions the first consists in maintaining a working temperature in the range of about 100 to 400° C.; the temperature being raised with increasing thickness of the sheet and the stage of molding. When the temperature of the metal is too low, it is not sufficiently ductile; at too high a temperature it is too soft, so that on drawing, the strips are easily torn. The working temperature to be employed varies also to some extent as is easily ascertained in each case according to the composition of the alloy under treatment and the effect to be attained. A further condition which I found of special importance for treating these alloys is that the drawing should be effected through at least two dies. The dies are of different shape, the cut in the first die (the fore-die) imparting only a preliminary shape to the sheet metal strip, in which the raw outlines of the profile are produced, whereas the second die (the end-die) corresponds to the final shape of the profile in all its details.

These dies can be easily and cheaply manufactured as they may consist merely of a plate of moderately thick sheet-steel or other hard metal into which the profiles of the fore-die and the end-die are cut.

When drawing a strip through dies of this character in the obvious manner, i. e., by entering the strip in a vertical direction to the plane of the dies, the planes of both dies being in a parallel position, it is impossible to produce straight profiles, since the finished profiles have a tendency to curve longitudinally owing to the stresses set up by the drawing process.

The principle underlying my invention now consists in counterbalancing these stresses by preventing the rectilinear passage of the strips through the dies, i. e., by passing the strips through the dies at a certain angle of inclination to the direction of the drawing forces.

The angle of inclination necessary so as to exactly counterbalance the tendency of the strips to curve, i. e., to produce straight profiles, depends on the shape of the particular profile and is easily ascertained by experiment.

However, when in view of the further use of the finished profiles, it is desired to obtain a definite curvature of the latter, this can likewise be effected by fixing the angle of inclination of the strip so as to differ from the angle of inclination as required for producing straight profiles.

One method of carring out my drawing process consists in placing both dies at a short distance, of say 5 to 20 centimetres, one after the other upon the drawing bench, in such a manner that the plane of the fore-die is not in parallel position to that of the end-die, but forms a certain angle of inclination therewith which angle may be finely adjusted by suitable means. In this way a rectilinear passing of the strips through both dies, parallel to the drawbench, is prevented.

In the annexed drawings, I have illustrated, by way of example, a fore-die and an end-die and their mounting on a draw bench.

Fig. 1 is a vertical transverse section through the fore-die. Fig. 2 is a vertical transverse section through the end-die. Fig. 3 is a vertical longitudinal section of the apparatus consisting of a fore-die f, mounted by screws on a supporting ring r, which is fixed on the draw bench d, and of an end-

die *e*, mounted correspondingly on r_1 and *d*. If desired, as shown in Fig. 3, an intermediary member *i* may be employed combining the rings *r* and r_1 in a fixed distance one from the other, *i* being screwed on the draw bench. It should be mentioned, however, that in Fig. 3 the angle of inclination of the fore-die has, for the sake of clearness, been exaggerated.

In certain cases the angle of inclination of the strip between the dies may also be effected by cutting the profile into the fore-die not vertically but at a corresponding angle.

A further mode of arrangement for producing the straight profile consists in rigidly connecting with each other the fore-die and the end-die, both in parallel position, by an intermediate member and placing the ensemble of dies at the required angle of inclination toward the plane of the drawbench. Hereby it is rendered possible to provide the drawbench with an adjustable adapter suitable for any set of dies. In case the shape of the desired profile requires an extremely large angle of inclination, the last-mentioned arrangement may also be used in combination with the angular adjustment of the fore-die.

In accordance with the foregoing statement more than one fore-die may be used for the preliminary formation of the strips.

In following the improved method the end of a sheet metal strip is, before entering the die, bent in any known manner so that it can be passed through the broadest parts of the openings of the fore-die and the end-die, whereupon the drawing of the heated sheet metal strips through the moulds begins and is continued, recourse being had, if desired, to the usual lubricants.

I claim:—

1. The method of producing profiled sections of uniform thickness from flat strips of magnesium alloys which comprises drawing said strips and subjecting continuously consecutive cross-sections of said strips to at least two combinations of mechanical stresses simultaneously acting upon cross-sections of the strips having a definite longitudinal distance from each other and effecting a curvature of the cross-section, the points of action of said combinations of curving stresses, with the exception of the ultimate one, being shifted with respect to the direction of drawing, thereby causing a predetermined deflection of the strips between the points of action of two consecutive combinations of stresses.

2. The method of producing profiled sections of uniform thickness from flat strips of magnesium alloys which comprises drawing said strips at a temperature between about 100° and 400° C. and subjecting continuously consecutive cross-sections of said strips to at least two combinations of mechanical stresses simultaneously acting upon cross-sections of the strips having a definite longitudinal distance from each other and effecting a curvature of the cross-section, the points of action of said combinations of curving stresses, with the exception of the ultimate one, being shifted with respect to the direction of drawing, thereby causing a predetermined deflection of the strips between the points of action of two consecutive combinations of stresses.

3. The method of producing profiled sections of uniform thickness from flat strips of magnesium alloys which comprises drawing said strips and subjecting continuously consecutive cross-sections of said strips to at least two combinations of mechanical stresses simultaneously acting upon cross-sections of the strips having a definite longitudinal distance from each other and effecting a curvature of the cross-section, the points of action of said combinations of curving stresses, with the exception of the ultimate one, being shifted with respect to the direction of drawing, thereby causing a predetermined deflection of the strips between the points of action of two consecutive combinations of stresses, said deflection counterbalancing the curving effect of the stresses set up by the drawing process in the finished profile.

4. A drawbench for drawing profiled sections of uniform thickness from flat strips of magnesium alloys comprising, in operative combination, a fore-die adapted to impart a preliminary curvature to the cross-section of said strips, and a final die placed at a definite distance from said fore-die and adapted to impart the final shape to the preliminary curved cross-section of said strips, said dies being adapted to be inclined at a predetermined angle towards each other.

5. A drawbench for drawing profiled sections of uniform thickness from flat strips of magnesium alloys comprising, in operative combination, a plurality of fore-dies adapted to impart successive curvatures to the cross-section of said strips corresponding to successive intermediate stages of deformation of the cross-sections towards the profile desired, and a final die adapted to impart the final shape to the preliminarily curved cross-section of said strips, said dies being adapted to be inclined at a predetermined angle towards each other.

6. A drawbench for drawing profiled sections of uniform thickness from flat strips of magnesium alloys comprising, in operative combination, a support, means for adjusting said support at a predetermined angle to the drawbench plane, at least one fore-die and one final die placed at a definite distance from each other on said support, and means for securing a predetermined angle of inclination of said dies with respect to each other.

In testimony whereof I have hereunto set my hand.

ERNST DE RIDDER.