Dec. 4, 1962 P. MOREL ETAL 3,066,401

MANUFACTURE OF SPLINED INGOTS

Filed Feb. 8, 1960 2 Sheets-Sheet 1

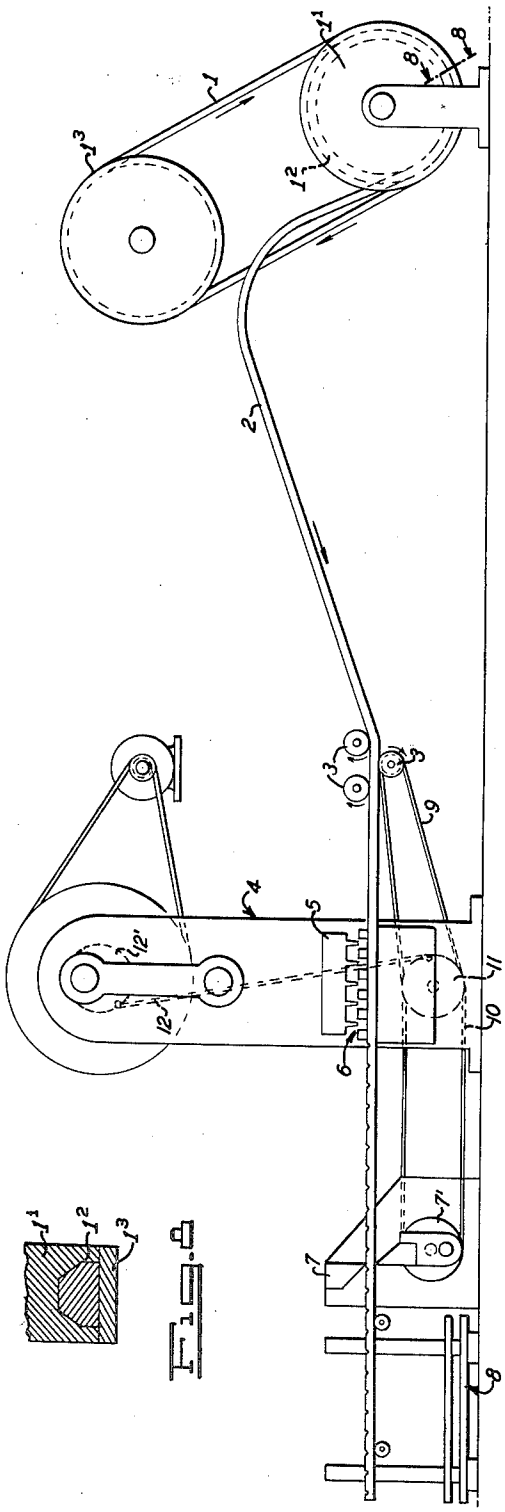

Fig. 8

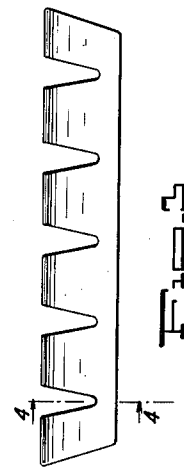

Fig. 7

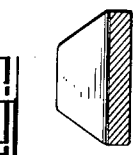

Fig. 6

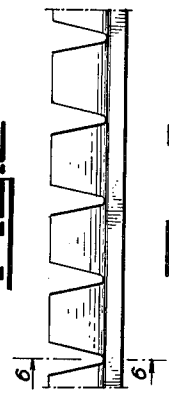

Fig. 5

Fig. 2

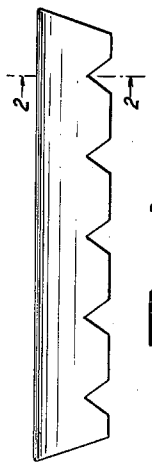

Fig. 1

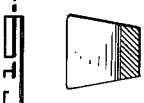

Fig. 4

INVENTORS

PAUL MOREL
ANDRE CREVOT

BY Raphael Tannered

ATTORNEY

Dec. 4, 1962 P. MOREL ETAL 3,066,401

MANUFACTURE OF SPLINED INGOTS

Filed Feb. 8, 1960 2 Sheets-Sheet 2

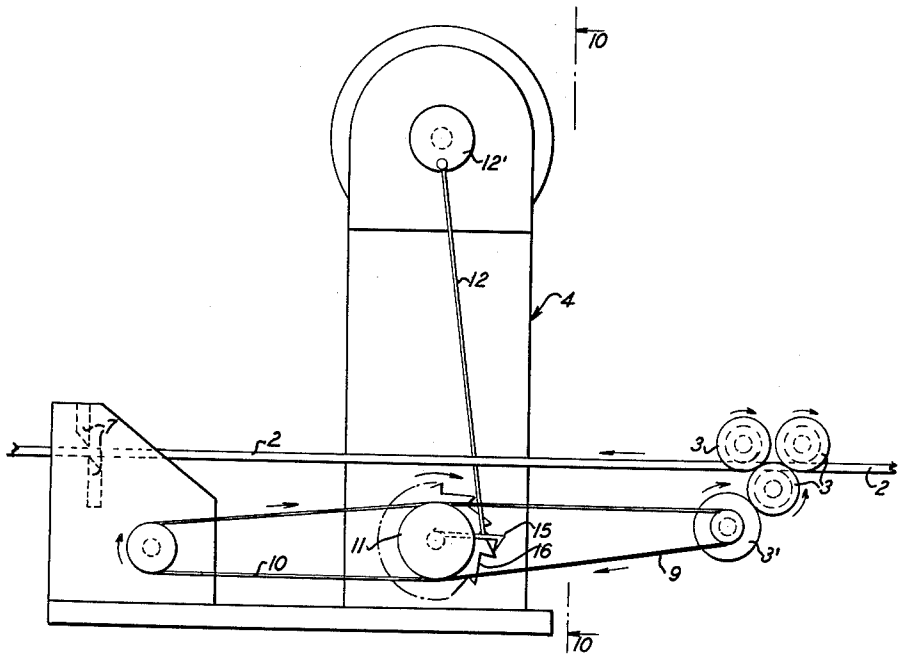

Fig. 9

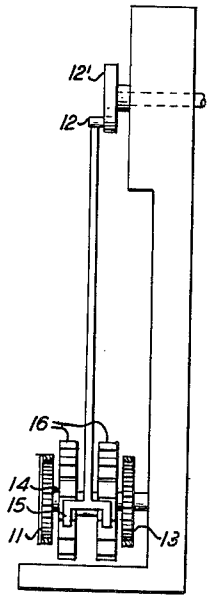

Fig. 10

INVENTORS

PAUL MOREL
ANDRÉ CRÉVOT

BY Raphael Tannover

ATTORNEY

United States Patent Office

3,066,401

Patented Dec. 4, 1962

3,066,401

MANUFACTURE OF SPLINED INGOTS

Paul Morel, Hermillon, and André Crevot, St. Jean-de-Maurienne, France, assignors to Pechiney, Compagnie de Produits Chimiques et Electrometallurgiques, Paris, France, a corporation of France

Filed Feb. 8, 1960, Ser. No. 7,284
Claims priority, application France Feb. 10, 1959
2 Claims. (Cl. 29—417)

The present invention, which results from the researches by applicants, has for its object a process and apparatus for the manufacture of splined metallic ingots, and the resultant products.

The invention will be explained with reference to the attached drawings, in which

FIGURE 1 is a schematic view in elevation of a splined ingot;

FIGURE 2 is a sectional view along lines 2—2 of FIGURE 1;

FIGURE 3 is a schematic view of another type of splined ingot;

FIGURE 4 is a sectional view along lines 4—4 of FIGURE 3;

FIGURE 5 is a view in elevation of a splined ingot, obtained according to the present invention;

FIGURE 6 is a sectional view along line 6—6 of FIGURE 5;

FIGURE 7 is a diagrammatic elevational view, partly in section, of an apparatus for carrying out the process of the invention;

FIGURE 8 is a section of a detail along line 8—8 of FIGURE 7; and

FIGURES 9 and 10 are schematic views of details, including one form of synchronizing means adapted for use in applicants' operation.

It is known to produce splined ingots by casting a molten metal in cast-iron ingot molds, or molds the bottoms of which are provided with indentations of more or less appreciable height and width. In this way, there are obtained ingots such as are represented in FIGURES 1 and 2.

It is also known to produce splined ingots in flat bottom ingot molds. In this case, following the casting operation, a grid or harrow is dipped into the top part of the fused metallic bath and its indentations penetrate deeply therein. This leads to ingots such as are represented in FIGURES 3 and 4.

These prior processes for the manufacture of splined ingots present major drawbacks. First of all, the casting operation is long and difficult; moreover, handling and storage of the splined ingots are delicate operations due to the risk of breakage and the limited length of the ingots which, generally, is less than about 40 centimeters and of the order of 370 mm.

The present applicants have developed a process for the rapid and economical manufacture of splined ingots which eliminates partially or totally the various drawbacks involved in the prior art processes.

The present invention has for its object a process and apparatus for the manufacture of splined ingots which consists in stamping a malleable metal blank.

According to a preferred, but non-limiting embodiment of the present invention, the said blank—which can be produced by molding in flat-bottom ingot molds—is produced by the continuous casting of the metal, according to a technique known per se, in a rotating wheel provided with a peripheral groove, to which is applied a band (belt) which covers the groove.

The metal blank, while in a still malleable form, is then stamped, for example, by means of a mechanical

press; there are thus indented in said blank regularly spaced splines which are obtained by the action of a die presenting similarly spaced indentations which are pressed into the blank.

The stamping rate is synchronized with the speed of the continuous casting of the metal, and the speed at which the metallic blank is introduced under the stamping press.

Moreover, the said press is provided with any device, such as for example, an ejector, enabling the immediate separation of the die from the blank following the stamping operation, in order to prevent the blank from being pulled out by the die.

The blank thus stamped is then automatically cut, by means of any device known per se, into units of predetermined length, dependent upon the subsequent use of the splined ingots produced according to the present invention; thus, one can directly obtain ingots of a length of the order of several tens centimeters, for example, of 370 mm., 740 mm., 1110 mm., or of any length whatever.

The accompanying FIGURES 5 and 6 represent, in front view and in section, a form of splined ingot obtained according to the present process from a blank having a trapezoidal section.

The following example, which is not given by way of limitation, will illustrate the process which is the object of the present invention.

According to a particular object of the invention, the present process is applied to the metallurgy of light metals, such as aluminum and aluminum alloys, use being made of the apparatus represented in FIGURE 7.

The reference number 1 generally designates any suitable continuous casting apparatus—illustrated in schematic form—for producing from molten metal a blank 2 of, say, trapezoidal section. For example, such a continuous solid blank can be obtained by means of a rotating wheel 1′ provided with a smooth trapezoidal shaped peripheral groove 1^2 which is covered by a movable endless band 1^3.

Molten metal is supplied by any suitable means known in the art—not shown—between the periphery of the rotating wheel 1′ and the travelling band 1^3. While still in a malleable state, the formed blank 2 is conveyed and guided by means of a set of rolls 3 and introduced under a mechanical stamping press shown schematically at 4, equipped with a die 5 having the form of a comb; this die strikes the blank at each blow of the press, impressing deeply (engraving) the design of its teeth in the blank. A fixed ejector device 6, in the form of a grid, prevents the blank from being pulled up by the die as the latter re-ascends during the operation of the press. At the outlet of the press, there is positioned an automatic shears 7 which cuts the pressed blanks into units of predetermined length; the splined ingots obtained in this manner are collected at 8.

The rate of press strikes and of cutting by the shears are synchronized as a function of the continuous casting speed of the molten metal, that is, of the forward speed of the blank. Such synchronization can be effected by any suitable means—as by an apparatus (represented in FIGS. 9 and 10) comprising a connecting-rod 12 and a crank 12′ keyed on the shaft of the stamping-press 4.

Connecting-rod 12 imparts alternating (up-and-down) motion to a lever 14 which drives, by means of a pawl and ratchet wheel system 15 and 16 (or a free-wheel system), the sprocket wheels 11 and 13.

The intermittent rotational movement of said sprocket wheels is transmitted by chains 9 and 10 respectively to the set of rolls 3 and to the shears 7.

Every 1, 2 or 3 press strikes, the pressed blank is cut

while the die is striking the malleable blank, said blank being then motionless.

The present invention also has for its object as novel industrial products, the splined ingots such as are illustrated in FIGURES 5 and 6.

Such ingots are commonly employed—among other uses—in steel works as deoxidizing products; they present the great advantage of being easily fragmented into units of variable and, if desired, small lengths and widths.

We claim:

1. Continuous process of forming splined ingots comprising the steps of: continuously molding a blank of indefinite length of solid cross section from molten metal; conveying the molded blank while in a malleable state to a stamping station; stamping the desired indentations into the blank by a vertically moving stamping means, preventing the stamped blank from traveling upwardly with the stamping means following a stamping operation, cutting the stamped blank into units of predetermined length and synchronizing the conveying and cutting operations with the stamping operations.

2. Apparatus for the manufacture of splined ingots comprising, in combination: means for continuously casting a metal blank of indefinite length; a stamping press comprising a movable die; means for conveying the formed blank to the stamping press, said press including means for preventing a stamped blank from being pulled along by the movable die following a stamping operation, and means synchronized with the stamping press for cutting the stamped blank into units of predetermined length.

References Cited in the file of this patent

UNITED STATES PATENTS

359,348	Daniels	Mar. 15, 1887
362,688	Washburn	May 10, 1887
611,574	Gay	Sept. 27, 1898
1,950,633	Schmeller	Mar. 13, 1934
2,008,626	Murakami	July 16, 1935
2,019,496	Kohlhaas	Nov. 5, 1935
2,157,097	Jung	May 9, 1939
2,447,437	Smith	Aug. 17, 1948
2,711,577	Leach	June 28, 1955
2,743,700	Toulmin	May 1, 1956
2,792,623	Melidonis	May 21, 1957
2,793,427	Marvin	May 28, 1957

FOREIGN PATENTS

669,464	Germany	Dec. 28, 1938