Feb. 6, 1962 G. NAESER 3,019,487

METHOD FOR ROLLING METAL POWDER

Filed July 15, 1958 2 Sheets-Sheet 1

FIG. 1

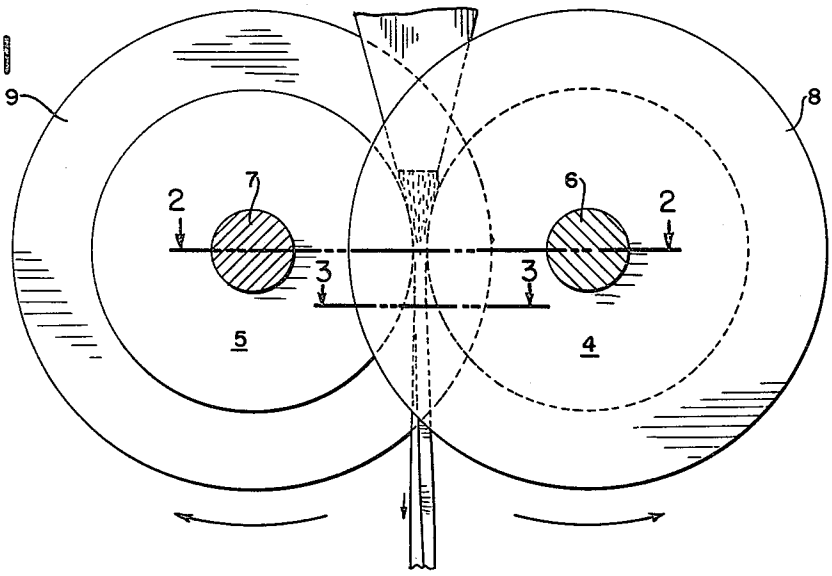


FIG. 2

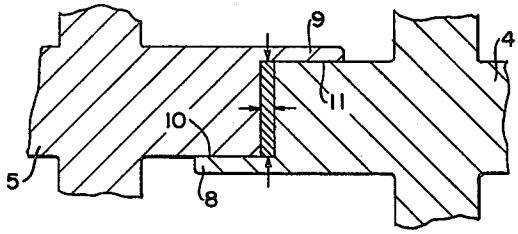
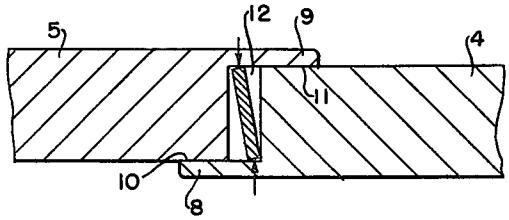


FIG. 3



INVENTOR
GERHARD NAESER
BY Penning Almond, Morton, Barrows and Taylor
ATTORNEYS

Feb. 6, 1962 G. NAESER 3,019,487

METHOD FOR ROLLING METAL POWDER

Filed July 15, 1958 2 Sheets-Sheet 2

FIG. 4

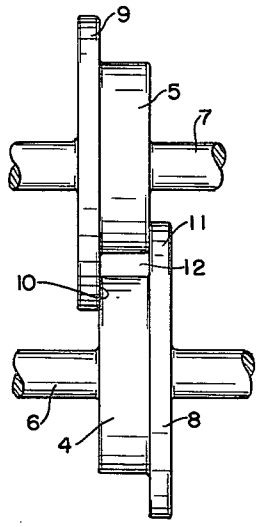


FIG. 5

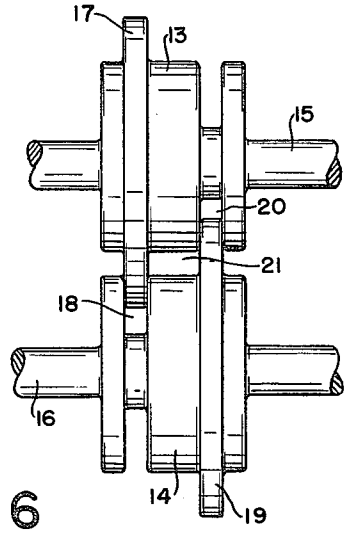
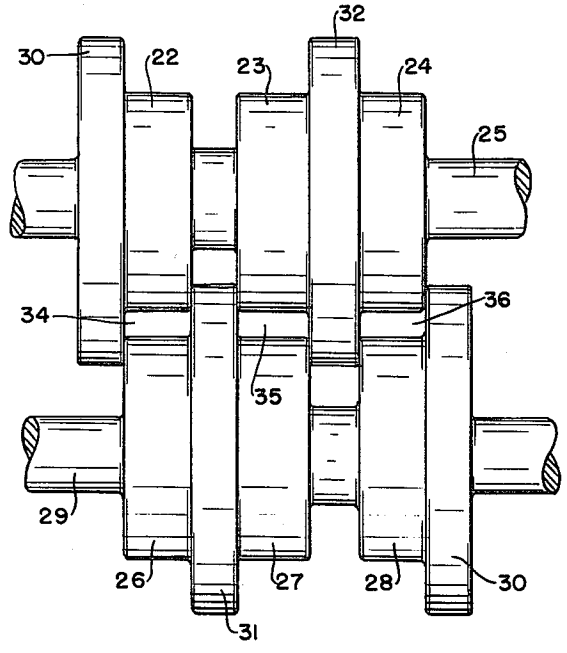


FIG. 6



INVENTOR
GERHARD NAESER
BY Pennie, Edmonds, Morton, Barrows and Taylor
ATTORNEYS

United States Patent Office 3,019,487
Patented Feb. 6, 1962

3,019,487

METHOD FOR ROLLING METAL POWDER

Gerhard Naeser, Duisburg-Huckingen, Germany, assignor to Mannesmann Aktiengesellschaft, Dusseldorf, Germany, a corporation of Germany

Filed July 15, 1958, Ser. No. 748,627
1 Claim. (Cl. 18—55)

This invention relates to a method of rolling metal powder for converting metal powder into wrought metal shapes such as metal sheets, strips, rods, wires and the like.

Metal powder has heretofore been rolled into wrought metal shapes by compressing the metal powder between oppositely disposed laterally spaced pressure rolls. The metal powder is introduced into the gap between the spaced rolls by means of a hopper by inserting the dispensing end of the hopper well down into the roll gap. When metal powder is rolled in this manner, the metal powder when being compressed is not confined along its edges, and the resulting metal strip is insufficiently compressed at its edges. Compressed metal strips formed in such a manner necessitate excessive trimming along the edges which results in a considerable amount of waste. It has also been proposed to provide one of the pressure rolls with flanges. Such flanges may protrude outwardly from the periphery of one of the rolls and extend into corresponding grooves in the opposite roll, or the flanges on one of the rolls may be attached to the outer faces of the roll and engage the outer faces of the other laterally spaced roll, such as disclosed in the Marvin Patent No. 2,341,732. Such a method restrains the outer edges of the metal powder continuously during the compression operation, but suffers from the disadvantage that the metal powder confined by the flanges on one of the rolls binds itself between the flanges and when the formed metal sheet or strip leaves the pressure rolls it tends to remain between the flanges and to continue around the flanged roll. This necessitates some additional procedure for removing the bound strip from between the flanges, and since the compacted strip when issuing from the pressure rolls is fairly weak, removal of the same from between the flanges often results in the breaking of the strip.

According to the present invention, the roll gap is closed by roll flanges or collars by securing one of the roll flanges circumferentially on one of the rolls and securing the other roll flange circumferentially on the other roll, and leaving a sufficient space between flanges to produce a compacted strip of the desired dimensions. When the metal powder is rolled by the method of this invention, the metal powder will be restrained at its lateral edges continuously throughout the compression operation. In addition, during operation of the rolls, the roll faces are separate below the line of centers of the rolls, and the flanges withdrawn in opposite directions from their respective positions during the compression operation. In consequence, the metal strip which once was pressed tightly with an end thrust on the flange rim is now released from that pressure by the fact that as the flanges separate in their respective directions, the distance between the flange faces increases and a twist results which causes the metal strip to pull away from one roll on the side away from its flange and from the other roll on the side away from its flange, thereby releasing the strip.

The method of this invention thus comprises compressing the metal powder between cylindrical compression surfaces to form a compact metal strip while tightly applying opposing thrusts to the lateral edges of the metal powder by means of the flanges attached to separate rolls. The opposing thrusts to the lateral edges of the metal

powder are applied to the compacted strip as well and throughout the entire compression operation. The opposing thrusts are withdrawn from each lateral edge of the compacted strip in opposite directions on a plane perpendicular to the direction of the end thrusts, after the metal powder has been compacted into a strip.

For a more detailed description of the invention reference may be had to the drawing in which:

FIGURE 1 is a side elevation of oppositely disposed compression rolls having flanges circumferentially secured to each roll on opposite sides,

FIGURE 2 is a cross section of FIGURE 1 taken along the line 2—2,

FIGURE 3 is a cross section of FIGURE 1 taken along the line 3—3,

FIGURE 4 is a plan view of the pressure roll construction of this invention, and

FIGURES 5 and 6 are modifications of the pressure roll construction of this invention.

As shown in the drawing, compression roll 4 is laterally spaced from compression roll 5. The rolls 4 and 5 are attached to suitable shafts 6 and 7 which can be driven by any suitable means. A flange 8 is circumferentially secured to one outer face of the roll 4, and a flange 9 is circumferentially secured to the opposite outer face of the pressure roll 5. The flanges 8 and 9 extend outwardly beyond the periphery of their respective rolls 4 and 5 and contact the opposite outer faces of the pressure rolls 4 and 5 as shown at 10 and 11 to close the roll gap 12.

The method of this invention whereby the lateral edges of the metal powder are restrained and the release of the metal strip after it has been compacted is more clearly shown in FIGURES 2 and 3. As shown in FIGURE 2 the metal powder is restrained at its edges by means of the lateral thrust exerted by the flanges 8 and 9 in the general direction of the arrows shown in the figure. As the compacted metal strip leaves the compacting area, the flanges 8 and 9 are withdrawn in opposite directions on a plane perpendicular to the direction of the end thrusts, thus effecting a slight twisting of the compacted strip, which in turn, effects the release of the compacted metal strip from the compression surfaces as well as release from the lateral thrusts in opposite directions permitting the compacted metal strip to pass out of the compression area without adhering or sticking to either of the compression surfaces.

The modification shown in FIGURE 5 shows oppositely disposed and laterally spaced pressure rolls 13 and 14 secured to suitable shafts 15 and 16. Flange 17 is circumferentially secured to the periphery of roll 13 and extends into a corresponding groove 18 in the oppositely disposed roll 14. Another flange 19 is circumferentially secured to the periphery of roll 14 and spaced from the flange 17 on roll 13 to define a roll-gap 21. The flange 19 extends into a corresponding groove 20 formed in roll 13.

FIGURE 6 illustrates a modification of the present invention whereby a plurality of metal strips may be simultaneously formed by compressing metal powder. In this modification a series of compression rolls 22, 23 and 24 are attached to, and suitably spaced on, a shaft 25. Oppositely disposed and laterally spaced therefrom are corresponding pressure rolls 26, 27 and 28 attached to a shaft 29 and suitably spaced to correspond to pressure rolls 22, 23 and 25. A flange 29 is secured to the outer face of pressure roller 22, while the flange 31 is secured to the roll 26 and to the roll 27. A flange 32 is secured to pressure rolls 23 and 24, and the flange 33 is secured to the outer face of roll 28. Each of said flanges, as shown, are circumferentially secured to the

respective rolls as noted. This construction, as shown, forms three closed roll-gaps **34, 35** and **36**.

In general, the flanges may be secured to the rolls in any manner desired; however, it has been found to be advantageous to form the flanges integral with the rolls rather than securing a plate to the rolls by some suitable fastening device. In constructing the flanges integral with the rolls, it is also advantageous to cut the flange and roll from the same stock and form a small fillet at the juncture of the flange and roll surface. Flanged rolls formed in this manner eliminate sharp corners and crevices at the juncture of the flange and roll, and form a more rigid and stronger structure. Other advantages of such an integral structure are that it permits easier withdrawal of the compact and prevents any possibility of the powder working itself into the crevices.

The compression roll apparatus of the present invention may be used to compress many different metal powders into wrought metal shapes such as copper, iron, lead, nickel, cobalt and the like. Various mixtures of metal powder may also be used to produce alloys.

Although various changes and modifications may be made in the particular roll construction illustrated and described without departing from my invention, I have found that the roll construction as shown in FIGURE 1 is particularly advantageous. Such a construction is easier and cheaper to construct, is more sturdy, and contains no grooves into which metal powder may accidentally be deposited.

This application is a continuation-in-part of my prior application Serial No. 419,322, filed March 29, 1954, now abandoned.

I claim:

The method of making compacted strips of metal from metal powder which comprises compressing the metal powder between cylindrical compression surfaces having rounded peripheries to form a compact metal strip having lateral edges while tightly applying opposing thrusts to the lateral edges of the metal powder and compacted strip throughout the compression operation and withdrawing the end thrusts from each lateral edge of the compacted strip in opposite directions on a plane perpendicular to the direction of the end thrust after the metal powder has been compacted into a strip.

References Cited in the file of this patent

UNITED STATES PATENTS

421,625	Sims	Feb. 18, 1890
460,882	Nevegold	Oct. 6, 1891
2,341,732	Marvin	Feb. 15, 1944
2,760,229	Cheney et al.	Aug. 28, 1956

FOREIGN PATENTS

249,067	Italy	June 28, 1926