Feb. 11, 1930. A. C. MUNRO 1,746,671

BALL FORMING MACHINE

Filed Jan. 16, 1928

Fig. 1.

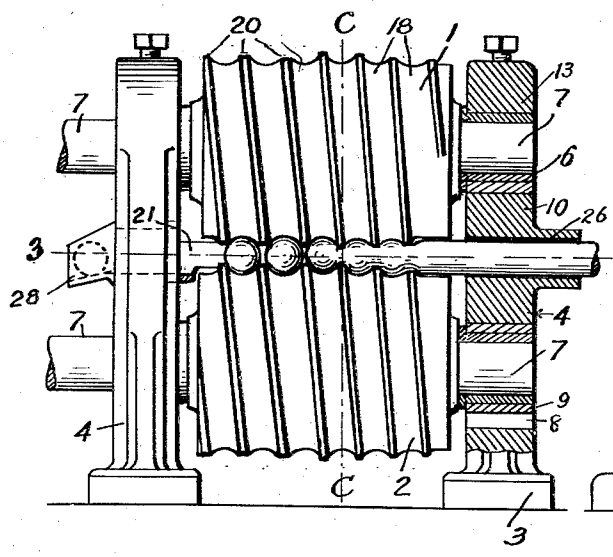


Fig. 2.

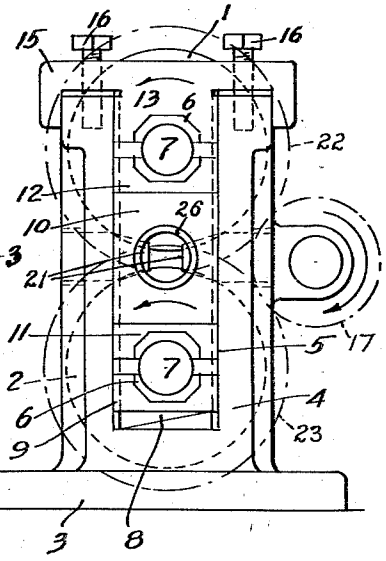


Fig. 3.

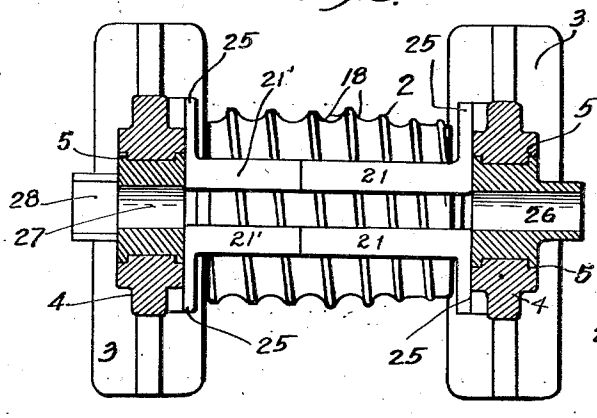
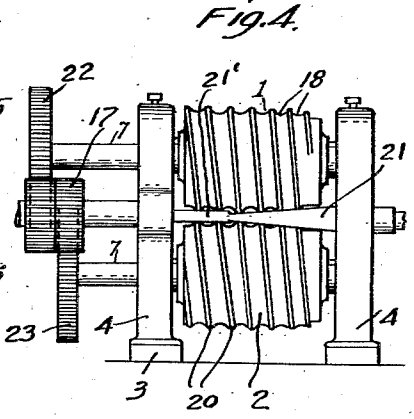


Fig. 4.



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UNITED STATES PATENT OFFICE

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BALL-FORMING MACHINE

Application filed January 16, 1928. Serial No. 246,997.

This invention relates to improvements in ball forming machines and the main object of the invention is to provide a machine which is adapted to form balls or approximately spherical bodies from bars, rails or other similar stock material, in an efficient and economical manner.

A further object of the invention is to provide, in such a machine, improved means for severing the balls from the stock and for guiding the material both before and after such severance.

The accompanying drawings illustrate embodiments of my invention and referring thereto:

Fig. 1 is a longitudinal section of the machine, partly in elevation.

Fig. 2 is an end elevation thereof.

Fig. 3 is a horizontal section on line 3—3 in Fig. 1.

Fig. 4 is a side elevation of the machine.

The machine comprises a pair of rolls 1 and 2, mounted, one above the other, on a frame comprising a base 3 and suitable standards 4, said standards being provided with vertical ways 5 in which are mounted pillow blocks carrying the journal members 6 for the shafts or trunnions 7 of the respective rolls 1 and 2, provided with suitable driving means. Wedge means 8 at the lower end of the ways 5 adjustably support the lowermost pillow block 9 and a spacer block 10 is interposed between the upper pillow block 11 for the lower roll and the lower pillow block 12 for the upper roll. The uppermost pillow block 13 is formed on a cap plate 15 which may be secured to the top of the standard 4 by suitable means, such as cap screws 16, such means serving to hold the pillow blocks and spacer block above referred to in proper position.

The rolls 1 and 2 are provided with circumferential helical grooves 18 similarly pitched and similarly inclined on the two rolls and the shafts 7 of the respective rolls are connected together by the usual gear means 17, 22 and 23 shown in Figs. 2 and 4, so as to rotate in unison in the same rotative direction and are so positioned that at each movement the opposing portions of the grooves 18 in the two rolls are in alignment or registration with one another. The said grooves 18 are formed with concave surfaces approximately centered from points on the longitudinal axis 3—3 of the machine, such axis being a horizontal line midway between the axes of the two rolls.

I prefer to form the grooves 18 in such a manner that in the initial operating portion of the rolls the said grooves have a certain pitch and in the subsequently operating portion of the rolls the said grooves have a steeper or more inclined pitch so that the grooves in such subsequently operating portion are spaced somewhat farther apart than in the initial portion of the rolls. Furthermore, the peripheral portions or flanges 20 of the rolls extending between successive grooves 18 progressively increase in diameter from the initial end of the roll to an intermediate point on the roll indicated by the line *c—c* in Fig. 1, this line indicating approximately the location of the plane at which the material is severed from the stock and being substantially or approximately coincident with the portions of the rolls at which the change in pitch of the grooves in the rolls takes place. The subsequently operating portions of the rolls are made of somewhat smaller diameter so that the peripheral portions or flanges thereof between the grooves 18 are spaced further apart than they are at the portions of the rows adjacent the plane *c—c* corresponding to the cutting off point. With such a construction the said flanges or peripheral portions of the rolls come closer together at the cutting off point than at any other point of the rolls.

A guide means 21 is provided at each side of the longitudinal axis 3—3 of the machine, each guide means consisting, for example, of a bar having a lug 25 at each end whereby it is secured to the respective standards 3, the inner faces 21 of the respective bars 21 extending parallel to one another at a distance apart corresponding substantially to or somewhat greater than the diameter of the balls to be formed. These guides 21, together with the upper and lower rolls 1 and 2, define a passage way through which the work or material is passed in the operation of the

machine, and the spacing blocks 10 aforesaid are provided respectively with passage ways or openings 26 and 27 in alignment with the said passage way between the guide members and the rolls, so as to guide the stock to the rolls and deliver the formed balls from the rolls. A delivery chute 28 may be provided on the block 10 at the delivery end of the machine to carry the formed balls away from the delivery passage 27 to any suitable receiving means.

In order to enable the guide members 21 to be brought sufficiently close to the center line or axis 3—3 of the machine to effectively support the material during the forming operation I have found it desirable to taper the guide means 21 from the initial end of the machine to the point of cut-off adjacent the plane *c—c*, this tapering being rendered desirable by reason of the progressive enlargement of the intergroove flanges or peripheral portions of the rolls and the resulting diminishing space between said flanges. Beyond this point the guide members 21 are made wider as indicated at 21′ to provide increased strength and prevent cutting of the balls, it being understood that from this point on the work consists of separated balls which must be supported as regards lateral movement wholly by said guides, whereas in the initial portion of the machine the work consists of a non-severed bar or rail which is supported to a large extent by its bearing in the inlet passage 26 and therefore does not exert as strong a pressure on the guiding means as is liable to occur in the case of the severed balls. The above described construction, therefore, provides for maximum strength of the guide means, consistent with the necessary proximity of the guide means to the axis 3—3 of the machine and to the contracted space between the rolls. Moreover, the increased width of the guide bar at this position of the rolls has an important advantage in preventing scoring of the balls from the point, in a single thread machine, where the ball stock is severed, good widths of guides are absolutely necessary in order not to core the hot balls unduly in the final part of the machine. If the diameter of the peripheral ribs is not decreased in the finishing zone the balls are badly cut by the narrow width guides. The combination of guides, and increase in pitch, coupled with increase in diameter to the point where the ball is severed, followed by a decrease in diameter to allow wide guides, is therefore essential to successful operation of the machine.

The operation is as follows: The work, consisting, for example, of discarded railway rails or other scrap rail stock, is passed in through opening 26, by hand or otherwise, and being gripped between the opposing rolls, is advanced between the rolls by the action of the helical grooves thereof which also operate to gradually form the work piece into ball segments, which are finally separated into balls adjacent the plane *c—c* by the approximation of the intergroove flanges at that portion of the rolls and by the stretching action due to the sudden increase of pitch of the rolls adjacent that portion. The twisting action due to the rotation of the rolls also tends to twist off the balls at the stated position.

The balls formed in the manner above described are carried forward between the grooves in opposing rolls and the stationary guide members and are discharged through the delivery means 27 aforesaid.

My improved ball forming machine may be used in producing balls from any suitable stock material, for example ingot bars or bar stock as well as from compressed scrap rail, the bar stock or other stock material being heated and passed through the machine while still hot. An important advantage of the increased width of the guide or forming grooves in the final portion of the rolls is that the wide guides or grooves do not score or cut the balls as is liable to occur in the case of grooves which are of the same width as the grooves in the initial forming portion of the rolls.

I claim:

1. A ball forming machine comprising a frame, two rolls mounted on said frame to rotate on parallel axes, means for driving said rolls in the same rotative direction, and means for guiding a work piece between the rolls, in a direction parallel to the rotative axes of the rolls, said guiding means comprising guide bars mounted on the frame on either side of the path of the work between the rolls, said rolls having corresponding helical grooves adapted to form and separate the work piece into balls as it passes between the rolls, and peripheral portions of the rolls increasing in diameter from the initial portions of the rolls to a point intermediate the ends of the rolls, and being of decreased diameter in the final operating portion of the rolls.

2. A ball forming machine comprising a frame, two rolls mounted to rotate on said frame on parallel axes, means for driving said rolls in the same rotative direction, and means for guiding a work piece between the rolls, in a direction parallel to the rotative axes of the rolls, said guiding means comprising guide bars mounted on the frame on either side of the path of the work between the rolls, said rolls having corresponding helical grooves adapted to form and separate the work piece into balls as it passes between the rolls, the peripheral portions of the rolls increasing in diameter from the initial portions of the rolls to a point intermediate the ends of the rolls, and being of decreased di-

ameter in the final operating portion of the rolls, so as to provide increased space between the rolls at such portion and said guide bars being tapered from the initial portion of the rolls to a position opposite said intermediate point and being of increased width opposite the finally operating portions of the rolls.

In testimony whereof I have hereunto subscribed my name this 3rd day of January 1928.

ALEXANDER C. MUNRO.