Aug. 21, 1934. F. IM SCHLAA 1,971,083

PRODUCTION OF BALL RACES AND THE LIKE

Filed June 1, 1932

Fig.1

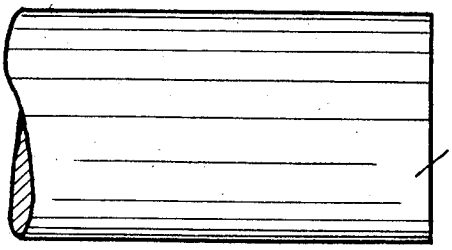


Fig.2

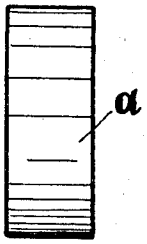


Fig.3

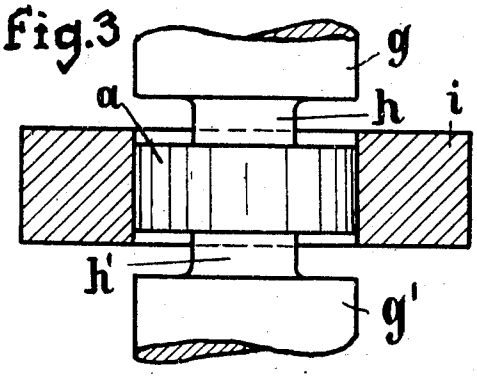


Fig.4

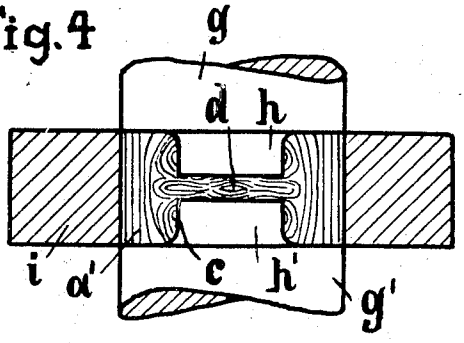


Fig.5

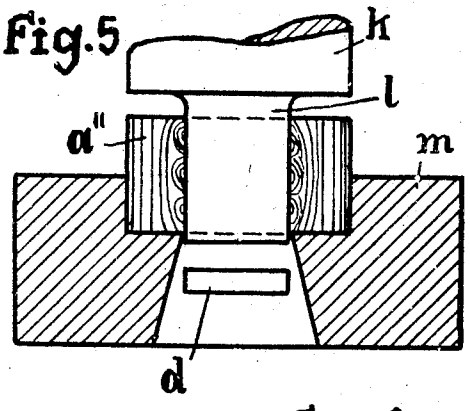


Fig 6

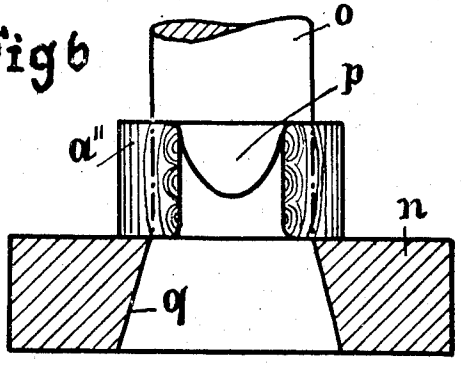


Fig.7

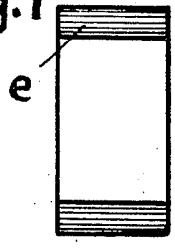


Fig.8

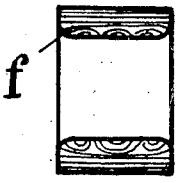


Fig.9

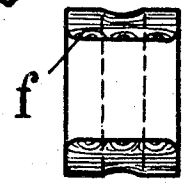
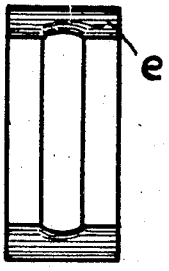


Fig.10



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PRODUCTION OF BALL RACES AND THE LIKE

Friedrich im Schlaa, Iserlohn, Germany

Application June 1, 1932, Serial No. 614,779
In Germany November 29, 1930

3 Claims. (Cl. 29—148.4)

Ball races have hitherto been made either by turning from the rod or by turning thick-walled tubes, and also by either forging on the forging machine or by hand forging. Owing to the fact that in the process of forging the rings are more or less exposed to the fire a considerable decarburization always takes place, so that only by means of turning considerable quantities of material can these decarburizing zones be eliminated. The result is a loss of material of at least 100 per cent. of the weight of the finished, turned ring. Further, the forging process has an exceedingly unfavourable influence on the structure of the material. The structure is not only warped, but is also easily torn. Above all, with forged rings of any type it is impossible to obtain for the fibres of the material the axial direction necesasry for a good ball race.

In a good ball race the ball must run transversely to the direction of the fibres of the material. In the case of rings turned from round steel rods the course of the ball is always transverse to the direction of the fibre of the material. In the case of thick-walled tubes the fibre does not run so exactly in axial direction as in the case of rods, but here also it can still be said that the formation of the fibres in the axial direction is obtained. Both processes, the turning of rings from the mass and also the slicing of rings from steel tubes, are very expensive. The rings turned from the mass, owing to the loss of material which far exceeds 100 per cent. of the material in the finished product, are the most expensive. The rings made from tubes involve only a relatively slight loss of material, but are likewise very expensive owing to the high cost of tubes.

This invention relates to a process of preparing working pieces for rolling ball races and the like, the fibre in which is directed axially and transversely to the guide surface of the balls, which process is distinguished from the known process by simplicity and economy.

The accompanying drawing shows, by way of example, a method of carrying out the process by representing the sections or forms in stages.

Fig. 1 shows the original rod and

Fig. 2 the disc separated therefrom.

Fig. 3 represents a press partly in section for pressing in a recess in the middle of the disc.

Fig. 4 is a similar view, the disc being compressed in its middle.

Fig. 5 shows a punching device for stamping out the middle of the ring.

Fig. 6 represents another punching device for separating the inner and the outer ring.

Fig. 7 is a sectional view of the outer ring.

Fig. 8 shows a section of the inner ring.

Figs. 9 and 10 represent the finished inner and outer ring.

In carrying out the process, from a steel rod, preferably of round or oval cross section, there is cut a disc and it is advantageous that the height of this disc should correspond to the height of the ring to be rolled. But even if the height of the portion of the rod exceeds the height of the ring by 25 per cent., a very good direction of the fibre is still obtained even when they are pressed together 25 per cent. by upsetting. The portion *a* is preferably separated from the rod *b*, whilst hot, by means of semi-circular knives and then comes under a press (Fig. 3) consisting of a die plate *i* and two dies *g*, *h* and *g'*, *h'*, which by pressing in the recesses *c* (Fig. 4) in the middle of the portion *a* produce a displacement of material and the press at the same time compresses the part, so far as is necessary, to the necessary height of the ring.

Then the relatively thin disc *d* (Fig. 3) still remaining in the middle of the ring *a'* is punched out by means of a punching die *k* cooperating with a die plate *m*, whereupon there is produced a thick-walled ring *a''* approximately as shown in Figs. 5 and 6. This thick-walled ring is then placed upon a die plate *n* having a central opening *q*, whose diameter corresponds approximately with the diameter of the circle formed by the centre of the balls of the race (Fig. 6). Thereupon the inner ring is stamped out by a punching die *o*, whose diameter is equal to the outer diameter of the inner ring and which enters the inner ring by means of a projecting central pin *p*, that ensures the adjustment of the initial ring *a''* against the die plate and the die punching respectively. The removed piece *f* thus produced (Fig. 8) is then used for the inner ring (Fig. 9), whereas the outer ring *e* (Fig. 7) provides the outer ring of the ball bearing (Fig. 10).

The operations of cutting, pressing, pressing in of the recess, stamping out the hole plate, and separation of the inner and outer ring is preferably carried out with the assistance of heat. As the separation of the inner and outer ring takes place in a manner in which it is impossible for decarburization to occur and there are no impurities in the material, a special turning of the ball running surfaces located on the positions of separation is not necessary. The rings thus obtained can be given any desired diameter by forging, rolling, or by means of a mandrel, with-

out causing the fibre of the material to be displaced from an axial direction. The sections of the original disc and the rings produced therefrom indicate the direction of the fibres in the several working stages.

I claim:

1. The method of forming pairs of cooperative ball race rings having the fibres of the material substantially parallel with the axis of the rings, consisting in severing a blank of predetermined shape from a rod having a longitudinal fibrous structure and of a diameter corresponding to the diameter of the final outer ball race ring, compressing the center of the blank on opposite sides thereof to force the fibres of the material laterally throughout the major thickness of the blank substantially parallel with the axis of the blank and continuing the opposite pressures on the blank to form an intermediate web, subsequently removing the web to form a tubular blank, and finally axially shearing the tubular blank to form inner and outer ball race rings with the fibres of the cooperating surfaces parallel.

2. The method of forming parts of cooperative ball race rings having the fibres of the materially substantially parallel with the axis of the rings, consisting in severing a blank of predetermined shape from a rod having a longitudinal fibrous structure and of a diameter corresponding to the diameter of the final outer ball race ring, compressing the center of the blank on opposite sides thereof to force the fibres of the material laterally throughout the major thickness of the blank substantially parallel with the axis of the blank and continuing the opposite pressures on the blank to form an intermediate web, subsequently removing the web to form a tubular blank, axially shearing the tubular blank to form inner and outer ball race rings with the fibres of the corresponding surfaces parallel and thereafter rolling out the surfaces on the parallel fibres of the rings to form ball races.

3. The method of forming pairs of cooperative ball race rings having the fibres of the material substantially parallel with the axis of the rings, consisting in severing a blank of predetermined shape from a rod having a longitudinal fibrous structure and of a diameter corresponding to the diameter of the final outer ball race ring, compressing the center of the blank to form a tube like blank and simultaneously force the fibres of the material laterally throughout the major thickness of the tube like blank substantially parallel with the axis thereof, and finally axially shearing the tube like blank through the compressed fibres to form inner and outer ball race rings with the fibres of the cooperating surfaces parallel.

FRIEDRICH IM SCHLAA.