Aug. 9, 1932. O. KADZIK 1,870,571

MACHINE FOR THE SPHERICAL GRINDING OF BILLIARD BALLS AND OTHER BLANKS

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Fig. 1

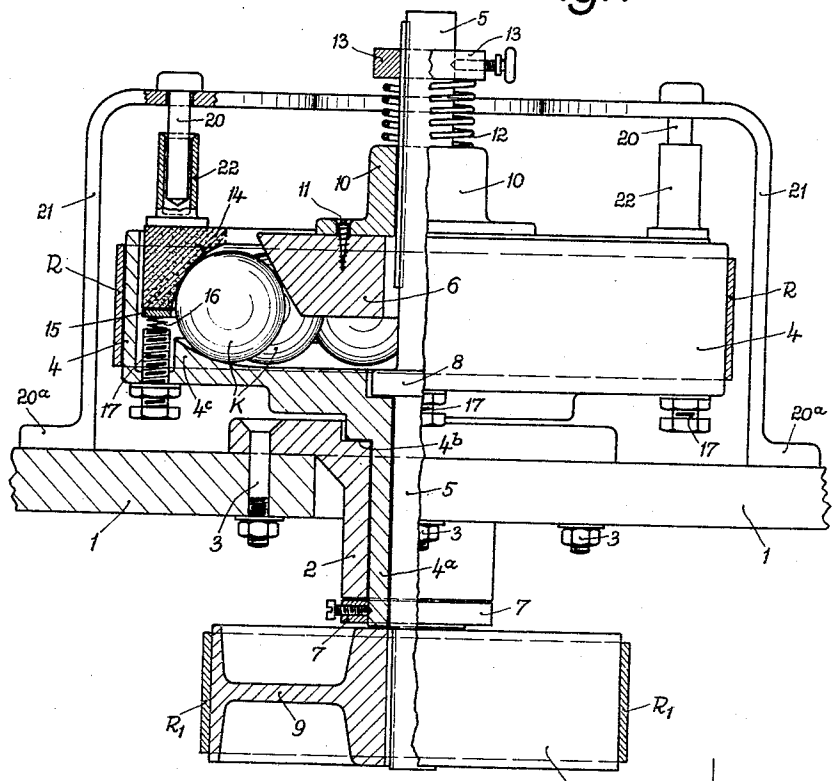
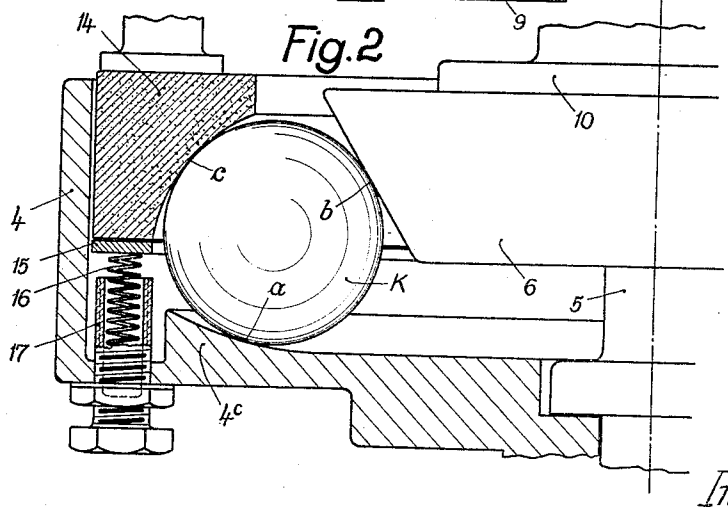


Fig. 2



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per [illegible]

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MACHINE FOR THE SPHERICAL GRINDING OF BILLIARD BALLS AND OTHER BLANKS

Application filed November 4, 1930, Serial No. 493,359, and in Austria October 15, 1930.

This invention relates to a machine for the spherical grinding of blanks and essentially consists in that an annular grinding member operates against the blanks with a working pressure which decreases automatically in accordance with the approach of the spherical shape of the blanks.

One mode of carrying out the present invention is illustrated by way of example on the accompanying sheet of drawings in which—

Fig. 1 is an elevation of the machine partly in section, and

Fig. 2 is a detail view on an enlarged scale.

A bearing 2 is fixed to a table 1 by means of screws 3. An extension 4^a of a casing 4 as well as a shaft 5 for operating a cone 6, consisting for instance of wood, are mounted in the bearing 2. The extension 4^a is secured against axial movement by its stepped part 4^b and by an adjusting ring 7. The shaft 5, rotating in the extension 4^a, is adjusted by means of a collar 8 and by the boss of a belt pulley 9 which is fixed, for instance keyed to the bottom end of the shaft 5.

A sliding sleeve 10 is secured, for instance by screws 11, to the cone 6 and rotatably coupled with the shaft 5 by tongue and groove and forced down by a spring 12. The extent of this pressure can be adjusted by an adjusting ring 13. The cone 6, subjected to the action of the spring 12, presses the balls K to be ground onto a spherical elevation 4^c of the bottom of the casing 4 and onto the spherical inner face of a grinding ring 14, which is lined with carborundum or another grinding material and rests on an annular disk 15, which is continuously forced upwards by springs 16 (for instance four springs) and thus reduces the pressure of the grinding ring 14 with respect to the balls. Each spring 16 is mounted in a screw-threaded sleeve 17, which is screwed vertically adjustable into the floor of the casing 4. The springs 16 are operative until the annular disk 15 rests on the top edge of the screw-threaded sleeves 17. It is important, that just at the beginning of the grinding operation the effect of the springs 16 on the grinding ring is reduced, and therefore the latter operates with greater pressure on the roughly ground balls. Near the end of the grinding operation, thus if the balls have been ground to practically the correct diameter, the tension of the springs 16 is increased and therefore relieve the pressure upon the grinding ring, so that the feed of the grinding ring is reduced considerably.

The device is driven for instance by way of a belt gearing, whereby for instance the casing 4 is driven by an open belt R, while the cone 6 is driven by a crossed belt R^1.

Therefore the casing 4 with its spherical elevation 4^c and the cone 6 are driven in opposite directions of rotation. Further the cone 6 rotates at a greater speed than the casing 4. In view thereof the balls, which bear on the spherical elevation at *a* (Fig. 2) and on the periphery of the cone 6 at *b*, are rotated around their axes as well as roll off in a circular path. However the balls also bear at *c* on the spherical inner face of the grinding ring 14, which either is held fast or carries out the movement to such an extent only as it participates in the movement of the balls. Therefore during their circular movement the balls roll upon the spherical inner face of the grinding ring 14 and consequently carry out a combined rotary and rolling motion, which prevents a one-sided removal of material and particularly the formation of poles.

The grinding ring 14 is held immovable by bolts 20, which pass through bores in the bracket 21 and into sleeves 22 fixed to the grinding ring 14. For facilitating the insertion of the balls, the bolts 20 are removed and the bracket 21 is turned round one of the two securing feet 20^a and away from the device.

The bolts 20 are removed if the grinding ring 14 is not to be arrested in order to provide for a finer work, because in this case the grinding ring removes small irregularities of the balls only, while in the event of larger irregularities the grinding ring is taken along by the said balls.

The device operates in the following manner:

The balls K, which for instance have been

roughly turned on a lathe, are placed into the device and the cone 6 as well as the grinding ring 14 are fitted thereto. The desired diameter of the balls is adjusted by means of the screw-threaded sleeves 17, which for this object may be provided with a scale, and now the device is rotated. The grinding ring 14, which for instance is immovable and slightly relieved by the springs 16, now grinds the balls K and therefore gradually moves downwards, so that the tension of the springs 16 is gradually increased. In view thereof the relieving effect of the same is increased and the grinding action of the ring 14, which apparently loses on weight (owing to the action of the springs 16), is gradually decreased in accordance with the progressive sinking of the grinding ring. Therefore the effect automatically passes from grinding to polishing. The downward movement of the grinding ring 14 is at an end if the same, or the ring 15 on which it rests, bears on the top end of the screw-threaded sleeves 17. In this position, the balls have been ground to the desired size and can be removed from the device.

On tensioning the spring 12 by means of the adjusting ring 13 it is possible to control or increase the removal of material, in order to more quickly grind the balls from their rough shape into the finished condition.

Without leaving the scope of the invention, the apparatus can be used for polishing, in which case the grinding ring 14 has to be fitted with a lining of felt or the like. In this case also the cone 6 may consist of felt or the like.

The machine as shown can be used for the spherical grinding of blanks of any kind and has been found to be of particular advantage as substitute for the known devices for turning of billiard balls. According to the present process the billiard balls are ground perfectly round in a fraction of the time necessary in the case of the known ball lathes, particularly in view thereof that in the device according to this invention from 20 to 50 balls (according to the size of the machine) can be formed perfectly spherical in a single operation (lasting from 15 to 20 minutes), while in the case of a known ball lathe a single ball can be treated during each operation only.

I claim—

1. Machine for the spherical grinding of blanks rolling on a rotary table comprising in combination an annular guide for the blanks, an annular grinding ring resting on the blanks to be treated, springs circumferentially arranged round said grinding ring and supporting the latter, the tension of said springs increasing automatically in accordance with the descent of the grinding ring and gradually decreasing thereby the grinding pressure exerted by the grinding ring on the blanks.

2. Machine for the spherical grinding of blanks rolling on a rotary table provided with a trough-shaped border comprising in combination an annular guide for the blanks, an annular grinding ring resting on the blanks to be treated, springs circumferentially arranged round said grinding ring and supporting the latter, the tension of said springs increasing automatically in accordance with the descent of the grinding ring and gradually decreasing thereby the grinding pressure exerted by the grinding ring on the blanks.

3. Machine for the spherical grinding of blanks rolling on a rotary table comprising in combination an annular guide for the blanks, an annular grinding ring resting on the blanks to be treated, vertically adjustable sleeves circumferentially arranged round said grinding ring in said table, a spring arranged in each sleeve, these springs extending beyond the upper ends of their sleeves for supporting the grinding ring and decreasing the grinding pressure in accordance with the descent of the grinding ring.

In testimony whereof I affix my signature.

OTTO KADZIK.