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BALL POLISHING DRUM FOR MASS PRODUCTION ARTICLES

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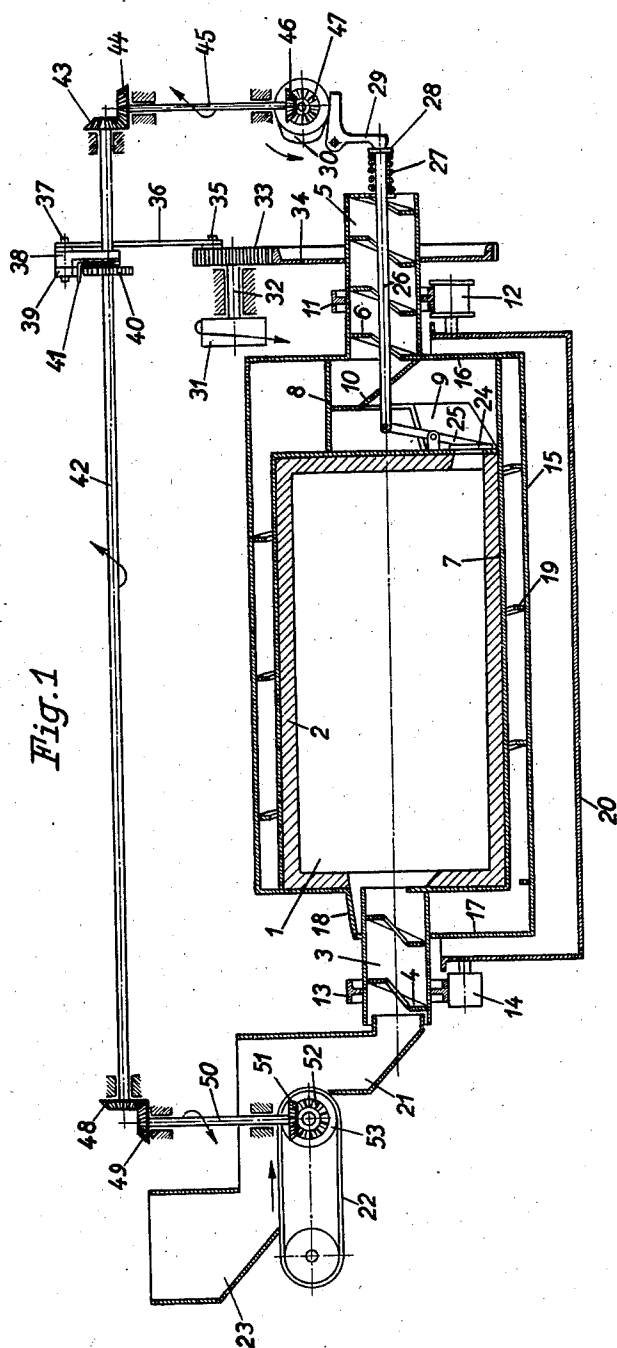


Fig. 1

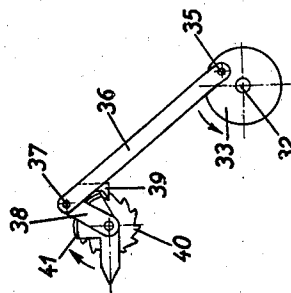


Fig. 2

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BALL POLISHING DRUM FOR MASS
PRODUCTION ARTICLESKarl Gürtelmeier, Leipzig, Germany, assignor to
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8 Claims. (Cl. 51-164)

Mass produced articles frequently require polishing before and after the electrolytic deposition of a metallic coating. A galvanized article is treated in a similar way. It is well known that a polished surface resists attack by chemical or corrosive substances much better than a rough surface. For this reason an adequate polishing treatment is of great value both before and after a plating process, as such polishing enables the plating to be of a substantially uniform and unbroken nature and thereby considerably enhances the resistance of said plating to oxidation and chemical attack.

For carrying out the polishing process with mass production objects there are known amongst other things so-called ball polishing drums. The goods to be treated are introduced together with steel elements of spherical or cylindrical shape into these drums, which are generally made from wood of a durable nature and are set into rotation until a polishing effect of the degree desired has been attained. The polishing elements can naturally also consist of another suitable material which is as hard as possible. Generally speaking, for furthering the polishing action the aqueous solution of a suitable lubricant such as polishing soap or the like is used. Looking at the cross section of the drum, the polishing process in the drum takes place principally in the upper layer of the mixture of the polishing elements and goods. In the case of cylindrical drums, the mixture occupies a section of the circular cross section of the drum varying in size according to the degree of filling. On the rotation of the drum the charge moves with a constant angular velocity corresponding to the particular number of revolutions, without the polishing elements and the goods altering their position relative to each other and to the wall of the drum until they have reached the upper layer of the cross section of the charge. At this point, the polishing elements and the goods roll away in the direction of the chord of the cross section of the charge, which is inclined at a certain angle of slope. Since the spherical or cylindrical elements used for polishing have in each case a smaller angle of slope than the mass produced objects, i. e., they slide more easily than the latter, they assume greater speed, when rolling away in the upper layer of the cross section of the charge, than the objects to be treated and thus roll on the surface of the goods, whereby the desired polishing action is obtained after a certain time. As shown by numerous observations during operation with drums of circular or polygonal sections, the polishing action occurs only in the upper layer, which is about 3-5 cm. thick, of the drum charge and this occurs in the direction of the chord of the cross section of the charge.

In order to obtain the desired polishing action in the shortest possible time, it is therefore appropriate to select the degree of charging of the drums so that the chord of the cross section of the charge is as long as possible. The most favourable value obtainable is given at a drum filling of 50%, since in this case the chord of the cross section of the charge is equal to the diameter of the drum.

In order that when ball polishing is being effected damage may be avoided in the drums to the mass produced articles treated, there must exist a certain mixture ratio between the polishing elements and the goods. For the satisfactory carrying out of the polishing process both this mixture ratio and the degree of charging of the drum should not be varied. As a result of these stipulations, hitherto there have as yet become known only polishing drums with which uninterrupted operation is possible, i. e., a definite quantity of goods is inserted into a drum with a likewise definite quantity of polishing elements and they are removed together from the drum only after termination of the polishing process, the polishing elements and the goods being subsequently separated from each other by suitable manually actuated or automatic sieving devices. For obtaining the maximum economy and above all for avoiding faulty results, which are possible to a considerable extent in any hand actuated apparatus, there arises the necessity, as in many of the automatic devices which have recently become known for the superficial treatment of mass produced articles, for producing a completely automatically operating drum for the ball polishing as well. The possibility of doing this is afforded by the present invention.

According to the present invention a rotatable drum for ball polishing mass produced articles is provided with means for introduction and withdrawal of charges comprising intermixed articles and polishing elements, said means being respectively disposed at opposite ends of said drum and adapted to introduce and withdraw continuously prearranged amounts of charge thereby governing the duration of treatment. By interposing a variable and adjustable transmission gear into the connection between the drive of the drum and the actuation of the withdrawal device, it is made possible to vary the duration of polishing as desired. Further, according to the invention, simultaneously with the actuation of the withdrawal device, there is directly coupled with the drive of the drum a suitable feeding device which conveys the mass production articles to be polished to the inlet of the drum in the same quantity as they are withdrawn completely polished from the opposite outlet end. The aforesaid variable and adjustable transmission gear is interposed be-

tween the drive of the drum and the actuation of the withdrawal and feeding device in such a way that feeding and withdrawal are regulated simultaneously with the adjustment of this transmission gear. By this means it is obtained that the same amount of goods is constantly contained in the polishing drum. Further, in order to keep the mixture ratio between the goods and the polishing elements also constant, the latter are automatically separated from the polished goods directly after withdrawal from the drum by means of a sieve connected with the outlet of the drum and are automatically brought back to the inlet end of the drum by suitable conveying device, where they again enter the drum together with the goods delivered by the feeding device.

A special device in the interior of the drum for conveying the intermixed goods and polishing elements from the inlet or the outlet is not necessary. The withdrawal orifice at the outlet end is so disposed that the particular gap occurring owing to the withdrawal of a certain quantity is automatically filled up again by the mixture of polishing elements and goods, which moves forward. Consequently the mixture of mass produced objects and polishing elements constantly supplied afresh at the inlet end gradually passes automatically towards the outlet end, whereby both the fullness of the drum and the mixture ratio between the polishing element and the goods continue to be obtained in constantly equal magnitude. Thus by means of the present invention, there has been produced a polishing drum in which mass produced objects are polished completely automatically and with a uniformity which cannot be obtained with the previously known manually operated drums.

An example of construction according to the present invention is shown diagrammatically in the accompanying drawing.

Figure 1 shows the new polishing drum in longitudinal section, while

Figure 2 is a side elevation of the variable and adjustable transmission gear which is interposed between the drive of the drum and the actuation of the conveying and withdrawal device.

In the example of construction illustrated, the polishing drum 1 is made of sheet steel. The jacket 7 of the drum can be of circular or polygonal section according to the size and shape of the objects to be treated. The interior of the drum is provided both on the jacket and on the side walls with a suitable hard wood lining 2 which ensures that the goods are not damaged during polishing. The entry of the goods to be polished into the drum is effected through the pipe 3, which is provided in the interior with the conveyor worm 4 which, on rotation of the drum, automatically brings the objects to be treated from the inlet funnel 21 to the inlet end of the drum. The exit of the finally polished goods from the drum takes place through the outlet pipe 5, which is equipped for this purpose with the conveyor worm 6 in its interior. At the outlet end, the jacket 7 of the drum merges into the guide path 8, which is constructed in the form of a sieve and which leads upwards in the form of a spiral to the outlet pipe 5. The mixture of polishing elements and completely polished goods, which leaves the drum 1 at the outlet end through the opening in the side wall is guided on to the guide path 8 by the sloping side sheet 9. On revolution of the drum, this

mixture automatically slides upwards on the spiral shaped path 8, which is constructed in the form of a sieve, up to the level of the outlet pipe 5, whereby the polishing elements fall through the meshes of the sieve into the outer jacket 15 of the drum, so that at the end of the guide path 8 only the sieved polished goods are fed via the sloping chute sheet 10 to the conveyor worm 6 of the outlet pipe 5. The sieved polishing elements, which are caught in the outer drum jacket 15, pass back to the inlet end of the drum 1 by means of the conveyor worm 19 fitted in the outer drum jacket. The conveyor worm 19 is naturally constructed to operate in the opposite direction to the worms 4 and 6 of the inlet or outlet pipe respectively. At the inlet end of the drum the outer drum jacket 15 merges into the spirally constructed guide path 18 on which, on revolution of the drum, the polishing elements screened off at the outlet automatically roll upwards as far as the inlet opening of the drum and through the latter enter the drum 1 again. For storing the polishing liquid mixed with a polishing medium, a trough or bath 20 is provided. The side sealing walls 16 and 17 of the outer drum jacket 15 are provided with a perforation, so that the polishing liquid can enter the interior of the drum from the trough or bath 20. The mounting of the polishing drum 1 is effected on the travelling rims 11 and 13, which are firmly connected with the outlet or inlet pipe respectively, in the rollers 12 and 14 which are suitably provided outside the trough or bath 20 in order to withdraw them from the action of the polishing liquid.

The feeding of the objects to be polished to the inlet funnel 21 is effected with the aid of a suitable feeding device for which, in the example of construction shown, the conveyor band from the working machines, which are disposed in front of it, through the inlet funnel 23, which can naturally also be replaced by larger supply bunker in as far as no continuously and automatically working machines are connected in front of the polishing drum.

The outlet opening provided at the outlet end of the polishing drum is closed by the flap 24, which is actuated through the impact rod 26 and the pivoted lever 27. In order to prevent the flap 24 being opened by the pressure of the charge of the drum, the pressure plate 28 is provided at the end of the impact rod 26. On this plate 28 the pressure spring 27 operates in such a manner that the impact rod 26 keeps the flap 24 closed through the pivoted lever 25. In order to open the flap at predetermined and adjustable intervals and thus to withdraw from the drum 21 a likewise pre-determined quantity of polishing elements and polished goods, the bell crank lever 28 is pressed against the plate 28 and the push rod 26, by the rotating cam 30 on the passage of the cam at any time, so that the pressure of the spring 27 is overcome and the flap 24 opens. After the cam has passed, the flap 24 is automatically closed again by the pressure of the spring 27.

The drive of the drum is effected from the main shaft 32, to which the necessary torque is transmitted by any suitable driving motor, for instance by way of the belt pulley 31. With the aid of the toothed wheel 33 and the toothed rim 34, which latter is firmly connected with the outlet pipe 5 of the drum, the driving moment is introduced from the main shaft 32 into the polishing drum 1. The driving wheel 33 is pro-

vided with a crank pin 35 from which the actuating shaft 42 for the simultaneous drive of the feeding and the withdrawal device is driven through an interposed regulable transmission gear.

In the example of construction shown, the interposed regulable transmission gear is provided in the form of a pawl and ratchet mechanism. In this pawl and ratchet mechanism the torque is transmitted from the crank pin 35 (Fig. 2) through the push rod 36 on to the rocking lever pin 37, which is disposed in the rocking lever 38.

The rotary movement of the driving wheel 33 is converted through the push rod 36 into a to and fro movement of the rocking lever 38, whereby the pawl 39 fitted to the pinion pin 37 drives the pawl wheel 40, which is firmly connected with the shaft 42, forwards in one direction of rotation. By means of the displaceable cover sheet 41 the angle of engagement of the pawl 39 and thus also the speed of the actuating shaft 42 can be varied and set as desired.

From the common actuating shaft 42 the rotary motion can firstly be transferred through the bevel wheels 43 and 44 and the vertical shaft 45 and through the bevel wheels 46 and 47 on to the cam 30 and further, through the bevel wheels 48 and 49, the vertical shaft 50, and the bevel wheels 51 and 52 into the band roller 53, which drives the conveyor band 22 of the feeding device.

The feeding and withdrawal device illustrated and also the interposed regulable transmission gear for the drives of these two devices may naturally also be constructed in any other suitable manner.

I claim:

1. An apparatus for polishing mass produced articles, comprising a rotatable drum having an inlet and an outlet port at its opposite ends respectively, a drive for rotating said drum, means for continuously feeding a charge to the drum through said inlet port, a valving device at said outlet port for the withdrawal of quantities of the charge, an intermittent drive for periodically actuating said valving device, and means for adjusting the frequency of operations of said intermittent drive per time unit independently of the speed of the drive of the drum.

2. An apparatus for polishing mass produced articles, comprising in combination, a rotatable drum having a port at each end, charging means for continuously feeding said articles through one of said ports, a valving device at the other one of said ports for the withdrawal of articles, an intermittent drive for periodically actuating said valving device, said intermittent drive being operative to cause the withdrawal of a quantity of articles at a predetermined ratio to the quantity of articles charged in the same time interval, and another drive for said charging means, both said drives being independent of the speed of rotation of the drum.

3. An apparatus as claimed in claim 2, in which the ratio of said intermittent drive in relation to said other drive is so selected that the quantity of articles charged is substantially equal to the quantity of the articles withdrawn in same time interval.

4. An apparatus for polishing mass produced articles, comprising in combination, a rotatable drum having a port at each end, charging means for continuously feeding said articles through one

of said ports, a valving device at the other one of said ports for the withdrawal of articles, an actuating means for said valving device, and an adjustable drive, independent of the speed of rotation of the drum, for operating said actuating means whereby the quantity of articles withdrawn per time unit can be adjusted.

5. An apparatus for polishing mass produced articles, comprising in combination, a rotatable drum having a port at each end, charging means for continuously feeding said articles through one of said ports, a valving device at the other one of said ports for the withdrawal of articles, an actuating means for said valving device, said actuating means being operative to cause the withdrawal of a quantity of articles at a predetermined ratio to the quantity of articles charged in the same time interval, and an adjustable common drive, independent of the speed of rotation of the drum, for said charging means and for said actuating means.

6. An apparatus for polishing mass produced articles, comprising in combination, a rotatable drum having a port at each end, a drive for said drum, charging means for continuously feeding said articles through one of said ports, a valving device at the other one of said ports for the withdrawal of articles, an actuating means for said valving device, said actuating means being operative to cause the withdrawal of a quantity of articles at a predetermined ratio to the quantity of articles charged in the same time interval, a common drive for said charging means and said actuating means, and an adjustable transmission connecting said last mentioned drive with said drive of said drum.

7. An apparatus for polishing mass produced articles comprising in combination, a rotatable drum having a port at each end, means for mixing polishing elements, such as balls with said articles to form a charge, feeding means for continuous introduction of said charge through one of said ports, a valving device at the other one of said ports for the withdrawal of quantities of the charge, an actuating means for said valving device, an adjustable drive, independent of the speed of rotation of the drum, for operating said actuating means, whereby the quantity of the charge withdrawn per time unit may be adjusted, a sieve for resolving the withdrawn charge, and a conveyor in connection with said drum for returning polishing elements sieved from said withdrawn charge to said mixing means.

8. An apparatus for polishing mass produced articles comprising in combination, a rotatable drum having a port at each end means for mixing polishing elements, such as balls with said articles to form a charge, feeding means for continuous introduction of said charge through one of said ports, a valving device at the other one of said ports for the withdrawal of quantities of the charge, an actuating means for said valving device, a sieve for resolving the withdrawn charge, means for returning polishing elements sieved from said withdrawn charge to said mixing chamber, a first common drive for operating said feeding means and said actuating means, a second common drive for said drum and said means for returning said polishing elements and an adjustable transmission connecting said first with said second drive.

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