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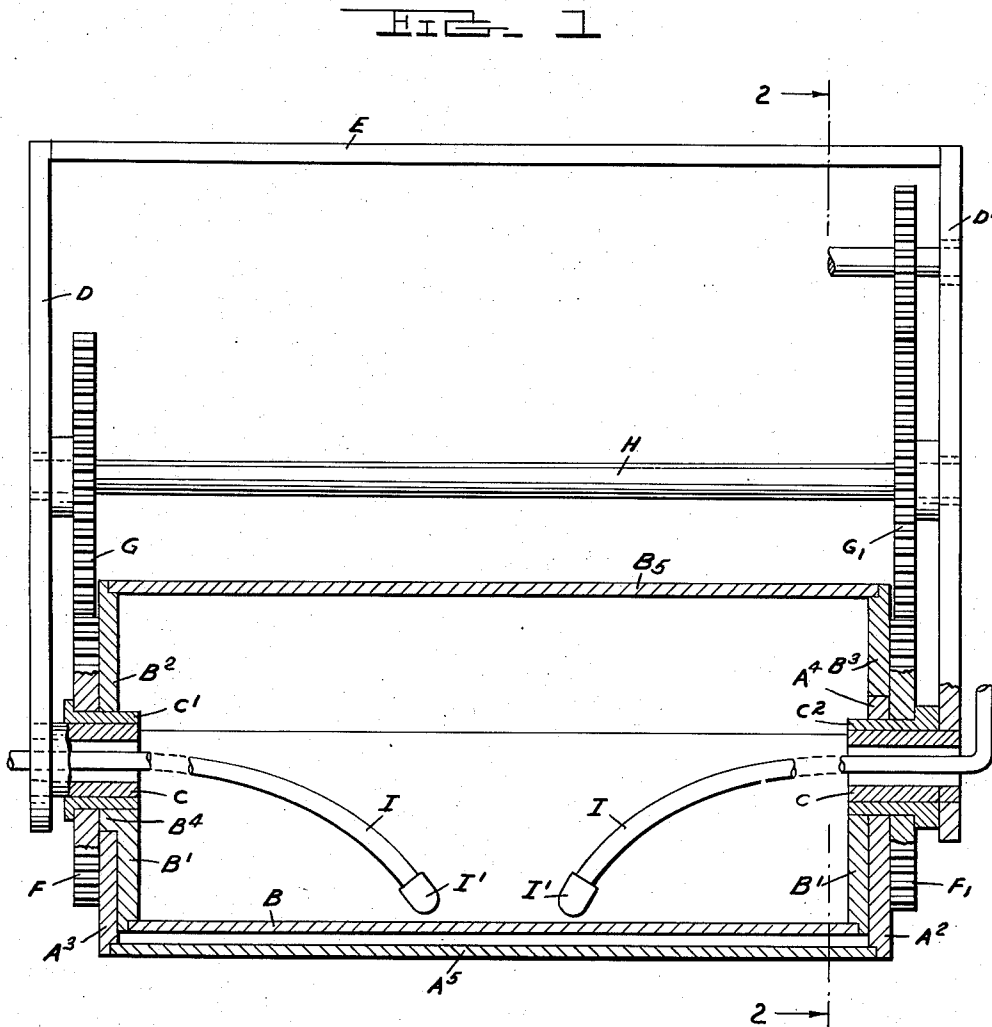
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APPARATUS FOR PROCESSING SMALL PARTS BY TUMBLING

Filed Nov. 12, 1957

3 Sheets-Sheet 1



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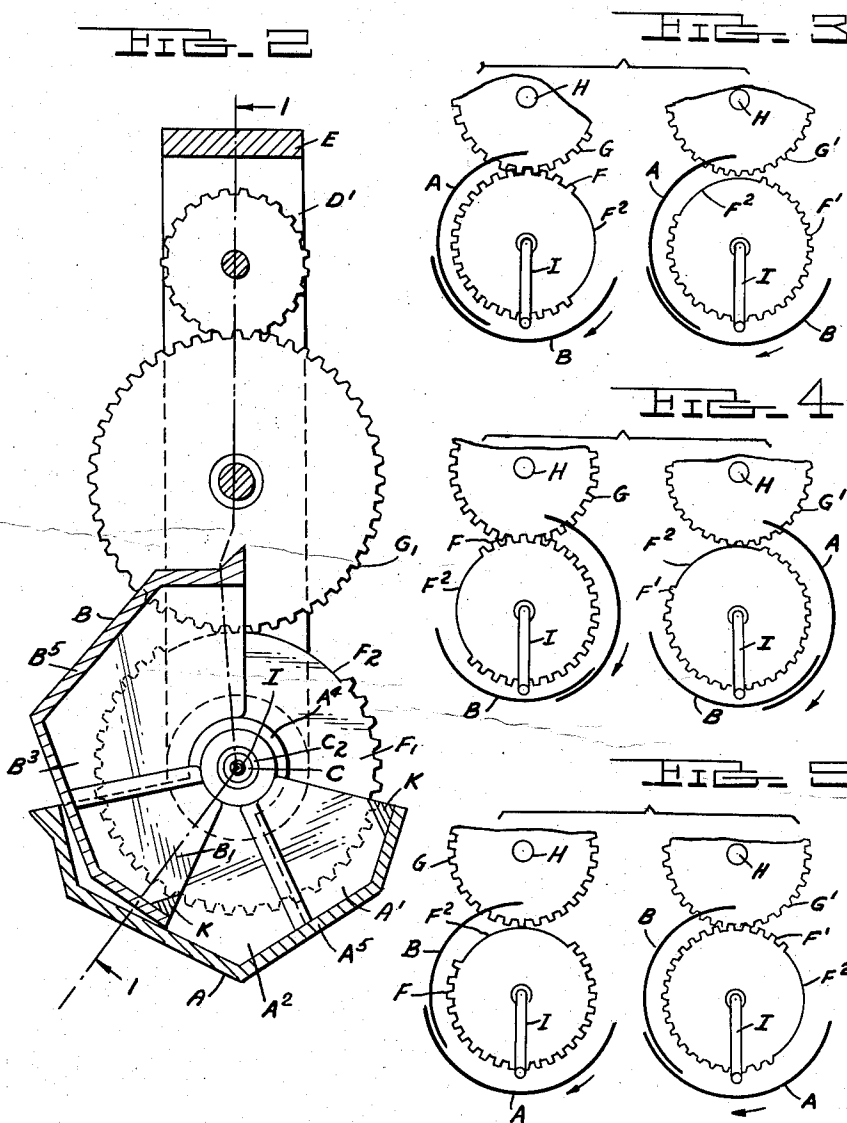
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Fig. 6

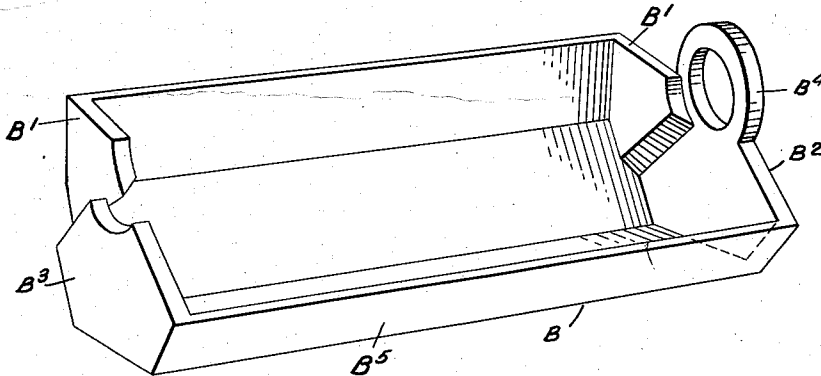
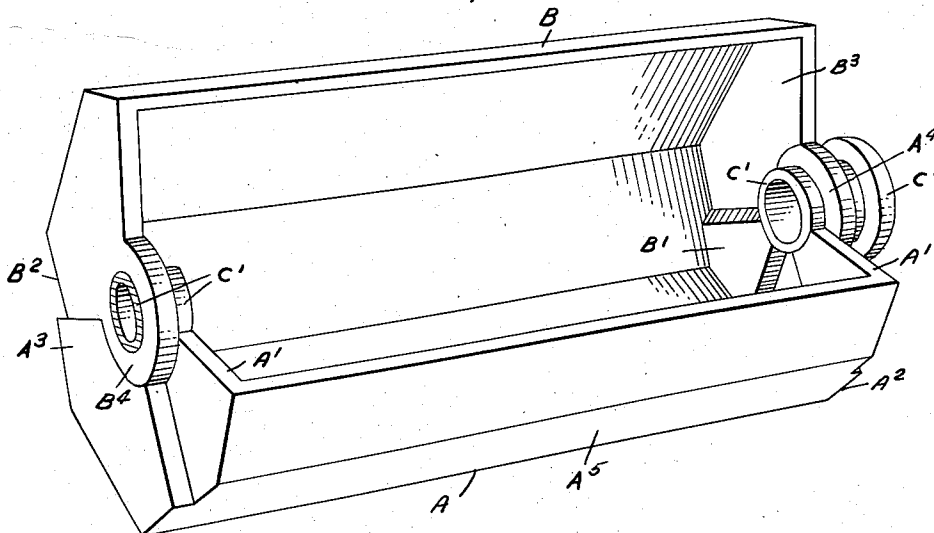


Fig. 7



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APPARATUS FOR PROCESSING SMALL PARTS BY TUMBLING

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11 Claims. (Cl. 259—57)

The invention relates to apparatus for processing small parts which are to be exposed to various treating media by a tumbling action and forms a continuation-in-part of our former application for patent, Serial No. 471,598, filed November 29, 1954. As for example, and as has been heretofore practiced, small parts which are to be electroplated have been placed in a tumbling barrel and immersed in the electrolyte where they are subjected to a tumbling action while in electrical contact with the cathode. The anode is outside of the tumbling barrel and to provide communication between the outside and inside of the barrel the latter is provided with perforated walls. However, it has been found that this interposes a high electrical resistance between the anode and cathode which necessitates increasing the difference of potential thereof over that required where there is no such obstruction. This also results in requiring a greater consumption of electrical energy to accomplish the plating and slows up the process.

It is the object of the invention to retain the tumbling action and at the same time to reduce the obstruction so that in electroplating the process can be carried out at lower voltage and more expeditiously. Also for other treatments it is advantageous to remove the obstruction between the interior and exterior. To this end the invention consists in a means for tumbling the work with free communication for the fluid between the interior and exterior of the tumbling means.

The invention further consists in the construction of a tumbling barrel formed of a plurality of segmental members which together are of an angular magnitude considerably less than 360° to leave an open segment, together with intermittent rotating means for said members through which this open segment is always above the work.

Still further the invention consists in the more specific construction as hereinafter set forth.

In the accompanying drawings:

Figure 1 is a longitudinal section through the improved tumbling apparatus on the line 1—1 of Figure 2.

Figure 2 is a cross section thereof on the line 2—2 of Figure 1.

Figures 3, 4 and 5 are diagrammatic cross sections showing the various positions of parts during rotation and tumbling action.

Figure 6 is a perspective view of one of the baskets, with year omitted.

Figure 7 is a perspective view of the two baskets in nested relation with certain parts omitted for clarity.

As shown in Figures 1, 2, and 7 A and B are segmental basket members rotatable about a common axis and connected to each other by hollow trunnions C at opposite ends thereof. Construction of one of the members (B) is shown in Fig. 6. This view shows the stepped end walls B¹ and B² and B¹ and B³, and the peripheral wall B⁵ as well as the basket support hub B⁴. The other basket member A is constructed to be the mirror image of the member shown. When the baskets are nested

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together in such a manner that the supporting hub A⁴ of basket A is on the opposite end of supporting hub B⁴ of basket B the members overlap each other to form, in effect, a single basket which is considerably less than 360° to leave a large open segment as shown in Fig. 7. Each basket is in fixed axial relation to the other as is obvious from the assembly shown in Figs. 1 and 7 and these basket members are also relatively movable and as will later appear, they are shifted from a position where the overlap is on one side thereof to a position where it is on the opposite side. As specifically shown, these segments are polygonal with eccentric portions having bounding sides with one of its bounding sides of greater radius than the other so that each will overlap the other on one side and underlap on the opposite side. The trunnions are supported in a frame including vertical members D and D' to the lower ends of which the trunnions are connected and a cross member or frame E at the upper end. The members of each of the pairs A¹ and A², A¹ and A³, B¹ and B², and B¹ and B³ overlap and are rigidly secured to each other to form stepped-end walls of baskets A and B respectively. Members A⁵ and B⁵ are the peripheral walls and have the leading edge at a greater distance from center of rotation than the trailing edge. The overlapping portions A² and A³ of the basket A are outside the portions B² of the basket B both radially and axially. The trunnions C are non-revolubly attached to the members D and D' and revoluble sleeve members C' and C² surrounding the members C extend through the hubs A⁴ and B⁴ of the end walls A² and B² and beyond the same. Gear wheels F and F' rotatable about sleeves C' and C² are on respective baskets A and B so as to move with the individual baskets. Therefore one gear wheel forms a support and driving member for the basket A and the other for the basket B. The gear wheels F and F' are in mesh with driving gear wheels G and G' which latter are connected by a shaft H so that both rotate together. However the gear wheels F and F' have their teeth interrupted at F² so as to pass out of mesh with the teeth of the gear wheels G and G' during a portion of each rotation. These interrupted portions in the two gears F and F' are so located with respect to each basket that when the basket is in the under, or work supporting position, the gear is out of mesh with its driving gear G or G', and when the basket is displaced from this position, the gear is in mesh with its respective drive gear. By this arrangement while one basket is at rest, the gear of the other is in mesh with its drive gear so that rotation will still be communicated thereto. Each of the basket members A and B when in rotation by its gears is adapted to drive the other member when in advance thereof and in contact therewith but to withdraw from contact with a basket in the rear. Thus when one of the baskets such as A is in the under or work supporting position, its movement will be temporarily arrested by the passing of its driving gear G out of mesh or in the interrupted portion of the gear F. The member B will still be driven and as a consequence, it will move across the open segment which is above the work withdrawing its underlapping trailing end consisting of walls B⁵ and B¹ from the member A and moving its advance end consisting of walls B⁵, B² and B³ into overlapping engagement with the opposite side of the member A. When the leading edges of the end walls B² and B³ of basket B come in contact with trailing edges of walls A³ and A² of member A, member B will then propel member A to move with it until gear F of member A is in mesh with its drive gear. When member B reaches on the underside in work supporting position its further movement is arrested while member A now rotated by its drive gear will withdraw its underlapping trailing end

from member B. Member A will now continue to rotate over and above member B bringing the leading edges of its end walls A³ and A² into contact with trailing edges of walls B² and B³ of member B, moving it into mesh with drive gear G', and until its own gear F is out of mesh with drive gear G. It will thus be understood that the opening between the members A and B is always above the work but is shifted from one side to the other while one of said members is at rest and the other moving.

Where the device is used for electroplating, insulated electric cables I are extended in through the hollow trunnions to the pile of work resting on the lower basket and the ends of said cables have metallic portions I' for conducting current to the work and forming a cathode thereof. The anode is outside of the baskets and is preferably in two portions on opposite sides thereof so that one portion is always adjacent to the open segment for free passage of the ions between the anode and cathode.

In operation and as diagrammatically illustrated in Figures 3 to 5 inclusive, the small part work pieces are loaded into the baskets A and B through the opening therebetween and are there in electrical connection with the cathode terminals of the cables I. Through the gear connections above described, the two baskets A and B rotate together through a portion of the cycle but when each is in a position below the work therein, it will be permitted to rest while the member above the work will be moved to withdraw its underlapping portion from the resting member and to move it into overlapping relation with the opposite side of said member. Thus, as shown in Figure 3, the member B is at the bottom and is resting, the member A having its trailing portion underlapping the member B or to the left, it being assumed that the rotation is in clockwise direction. In Figure 4, the member B is still at rest, but the member A has moved over the top from left to right to overlap the trailing portion of the member B. The members A and B then rotate together until attaining the position in Figure 5 where the member A occupies the position of the member B in Figure 3 after which its movement is arrested and the member B continues to rotate. These members may be arranged with reference to the angle of repose in the pile of work so that this pile as it tumbles will always fall into a supporting portion. At the same time, there is always a wide angle opening between the members A and B which is alternately at one side or the other or is divided between the two sides. Inasmuch as the anode has portions on opposite sides of the rotating members, at least one portion will always be adjacent to the opening between the exterior and interior. To facilitate distribution of the load within the basket at rest, which load tumbles from the rotating basket in advance thereof, each basket at its trailing end has an inwardly projecting rake portion K at an oblique angle to the radius. This operates to direct the tumbling work farther to the rear in the resting basket and avoid overloading of its portion forward of the axis to cause a reverse oscillation.

To discharge the work after completion of the process thereof it is only necessary to manually slightly rotate the lower basket immediately after it comes to rest to remesh its interrupted gear with the driving gear therefor. This causes both baskets to rotate together while the open segment therebetween passes to the underside to dump the work therethrough.

While we have thus far described the apparatus as used for electroplating, it is obvious that for many other treatments it is highly desirable to have free communication between the exterior and interior of the tumbling means. Even in the electroplating processes there are several treatments in separate tanks, some for cleaning and preparing the work for plating, and others for cleansing it after the plating process is completed. We have therefore made our unit so it can be easily shifted from one tank to another being lifted by the top portion E

of the frame. The means for driving the gear wheels G and G' may be either a motor carried by the frame or, if desired, they may be driven by any other suitable means.

5 What we claim as our invention is:

1. A tumbling holder for processing small parts comprising a pair of independently rotatable segmental cylindrical baskets having portions adapted for overlapping each other alternately on opposite sides, and when thus overlapped on one side leaving a relatively large open angular segment between their opposite sides, each basket being in fixed axial relation to the other and having one of its bounding sides of greater radius than the other and means for intermittently and alternately rotating each of said baskets in one and the same direction through a partial revolution about a common horizontal axis with an interval of rest between successive movements of each basket during which it is in supporting position for the work therein, each basket during its movement shifting the overlap from one side to the other thereof with the open segment always above the work.

2. The construction as in claim 1 in which the advanced side of each basket has a segmental portion of larger radius than that of its trailing side to overlap the outer face of the trailing side of the other basket.

3. The construction as in claim 1 in which the means for rotating said baskets comprises an interrupted gear on each basket and simultaneously rotating driving gears for the respective interrupted gears, the interruptions of said interrupted gears being positioned on their respective baskets to time the rest periods thereof.

4. The construction as in claim 2 in which, while one basket is at rest, the advance side of the rotating basket will move to overlap the trailing side of the resting basket.

5. The construction as in claim 2 in which the trailing side portion of each basket has a radially inwardly projecting rake which directs the work tumbling therefrom into the basket at rest farther to the rear in the latter, thereby checking tendency to reverse oscillation.

6. The construction as in claim 3 in which each interrupted gear while out of mesh with its driving gear is remeshed therewith after an interval through the rotation of its basket by the basket in rear thereof.

7. The construction as in claim 6 in which a slight manual rotation of the basket at rest immediately after the unmeshing of its interrupted gear will permit the open segment to pass below to discharge the work there-through.

8. The construction as in claim 5 having a lifting frame carrying said rotatable basket members and a driving mechanism thereon including said driving gears, said lifting frame forming a means for transferring said tumbling holder from one processing station to another.

9. A tumbling holder for processing small work parts comprising a plurality of segmental cylindrical baskets having portions adapted to overlap each other and rotatable in the same direction about a common horizontal axis and through successive revolutions, each basket being in fixed axial relation to the other and having one of its bounding sides of greater radius than the other said baskets together when overlapped having an angular magnitude sufficiently less than 360° to leave a large open segment, and means for alternately rotating each basket through a partial revolution while said open segment is above the axis and in advance of the basket being rotated, thereby closing the opening and opening a segment to the rear which also is above the axis and propelling the basket in advance, whereby during continuing tumbling of the work one of said baskets is always beneath to support the same and the open areas are out of the tumbling path.

10. A tumbling holder for processing small work parts comprising a pair of like segmental baskets rotatable about a common horizontal axis and together having an

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angular magnitude of less than 360° , leaving an open segment therebetween, each basket being in fixed axial relation to the other and having one of its bounding sides of greater radius than the other each basket being the mirror image of the other and having stepped end walls, means for intermittently and alternately rotating each basket in one and the same direction through a partial revolution with an intermediate period of rest during which each is below and in a position to support all of the work, said open segment being above and out of the tumbling path of the work and changing from one side to the other of each basket while stationary.

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11. The construction as in claim 10 in which the open segment is on the advance side of each basket at the beginning of each movement thereof and changes to the trailing side during said movement.

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