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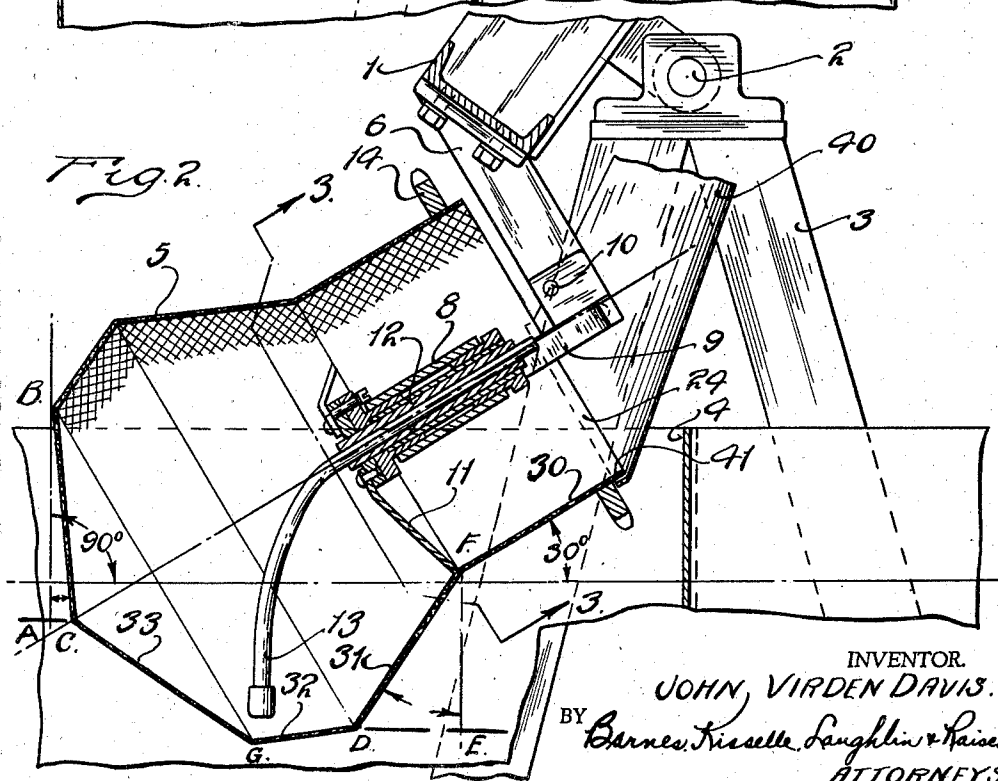
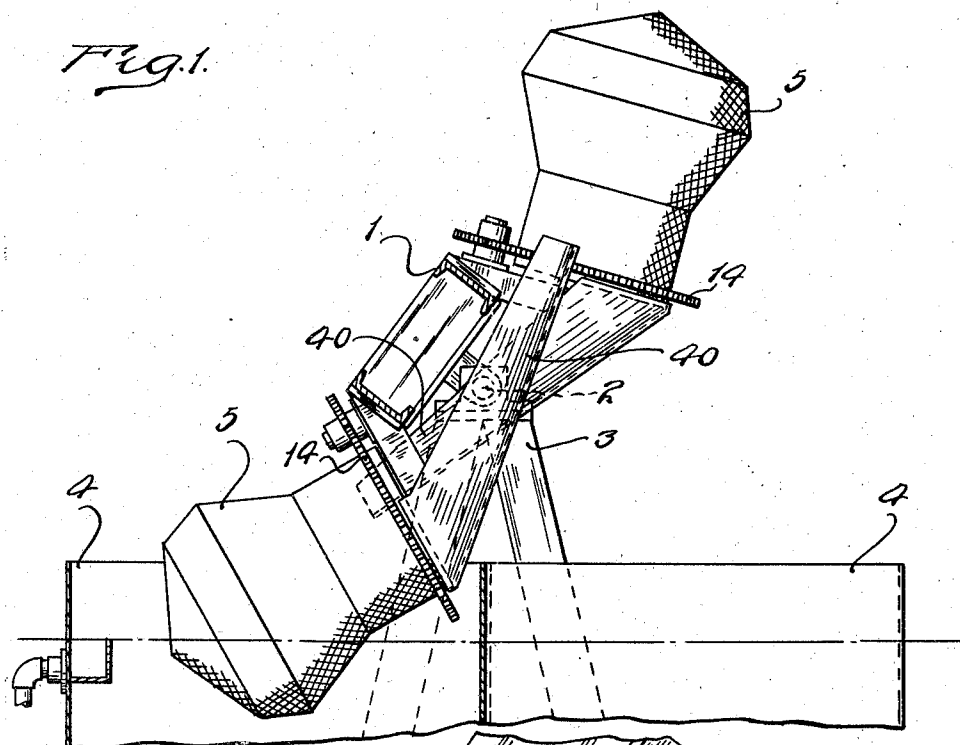
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2,290,036

MACHINE FOR TREATING ARTICLES IN BULK

Filed Nov. 14, 1940

2 Sheets-Sheet 1



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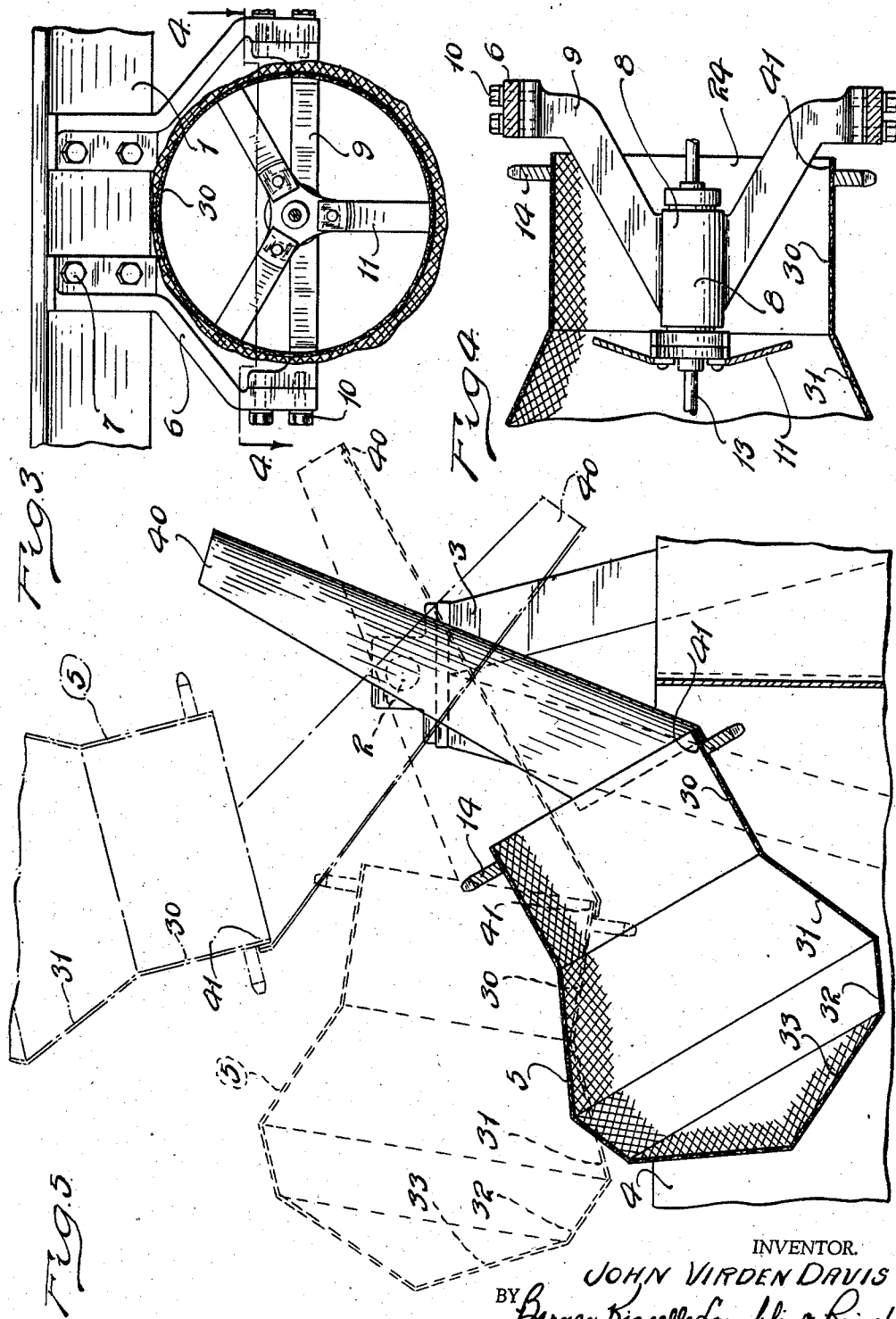
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MACHINE FOR TREATING ARTICLES IN BULK

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2 Sheets-Sheet 2



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UNITED STATES PATENT OFFICE

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MACHINE FOR TREATING ARTICLES IN BULK

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5 Claims. (Cl. 141-1)

This invention relates to a machine for treating articles in bulk, particularly small parts in bulk while subjecting the parts to treatments such as electrochemical cleaning, water rinsing, liquid chemical dips, electroplating, drying, chemical oxidation, phosphatizing, heat treating, etc.

In my copending application Serial No. 356,776, filed September 14, 1940, I have shown a machine for automatically handling small parts in bulk while subjecting the parts to various treatments such as those above-mentioned. In this automatic bulk treating machine the articles are contained in rotating barrels positioned in opposed rows. The rows of barrels are mounted on a pivoted frame so that as the one row is swung upwardly the other row swings down. Chutes running between the barrels in the opposed rows transfer the articles from the barrels in one row to the barrels in the opposite row and in this alternating transfer of the articles move them lengthwise of the rows. To effectively treat the articles while in the rotating barrel, the articles should be tumbled.

It is an object of this invention to produce a barrel which will efficiently tumble the articles. This object is achieved by constructing the barrel so that the articles cannot carry around with any surface of the rotating barrel and will always fall to the lower side of the barrel without making a complete revolution.

It is an object of this invention to produce a barrel which will cooperate with a chute to effectively discharge all of the articles from the barrel into a chute as the barrel is raised so that the articles will be transferred by the chute either into the opposed barrel or suitable container. This object is achieved by designing the barrel so that the articles will not be discharged from the barrel towards or into the chute until the chute has attained a sufficient inclination to insure that the articles will slide by gravity down the chute to transfer the same.

In the drawings:

Fig. 1 is an end elevation and partly a section through the machine showing two opposed barrels one of which is lowered into the tank containing the solution for treating the articles.

Fig. 2 is an enlarged vertical section through the barrel.

Fig. 3 is a section along the line 3-3 of Fig. 2.

Fig. 4 is a section along the line 4-4 of Fig. 3.

Fig. 5 is a diagrammatic view illustrating several positions of the barrel as it travels from fully lowered to fully raised position.

The machine comprises a rectangular frame 1

made from channel irons which is pivotally supported as at 2 upon the stationary frame 3. The tanks for the liquid, gaseous, or other media in which the articles are to be treated are referenced 4.

The rotatable barrels are referenced 5. The support for each barrel 5 comprises a pair of brackets 6 which are secured to the frame member 1 by bolts 7. A bearing member 8 is carried by a V bracket 9 secured to the bracket 6 by the bolts 10. Each barrel 5 is fixed to a spider 11 which is fixed to a hollow shaft 12 journaled within bearing 8.

The insulated electrical conductor 13 extends through the hollow shaft 12. When the articles are to be electroplated, then the conductor 13 will take the form of a cathode and the metal to be plated will be supplied from the plating solution in tank 4. As the metal is plated out of the solution, it can be replenished by the use of suitable soluble anodes of the metal to be plated.

By referring to Figs. 2 and 3, it will be noted that this rotatable mounting of the barrel upon the frame 1 leaves the open end 24 of the barrel 5 clear and unobstructed for the feeding of the articles into and discharging the same from the barrel.

The barrel 5 is arranged to be rotated about bearing support 8 by any suitable driving arrangement. As shown, the barrel 5 is provided with a sprocket 14 adjacent the open end of the barrel and perpendicular to the bearing 8. The sprocket 14 meshes with a driving chain which in turn is driven by an electric driving motor and driving sprockets.

Barrel 5 preferably is foraminated and can be made from any suitable material. The choice of the material will depend, of course, upon the nature of the liquid or gaseous article treating medium to which the barrel is subjected.

Barrel 5 is designed to accomplish, among others, two purposes, namely, to efficiently tumble the articles being treated and to discharge the articles from the barrel without jamming. To accomplish these purposes the barrel is fabricated with an end wall that flares outwardly from a point on the axis of rotation toward the opposite or open end of the barrel. The amount of flare should be such that the end wall will always have some radial portion making an angle with the horizontal greater than the angle of repose of the articles being tumbled, that is, the angle with the horizontal should be such that the articles will not remain piled but will roll toward the lower side of the barrel. The

end wall can take the form of a pyramid, a spherical or spheroidal cap, that is, the portion of the sphere or spheroid cut off by a plane running through the sphere or spheroid. As shown, end wall 33 is a pyramid in form. Another portion 31 of the barrel should taper or converge inwardly toward the axis of rotation and toward the open end of the barrel. The amount of flare should be such that the bottom of this section always makes an angle with the vertical, when the barrel is lowered, less than the angle of repose. This portion can take the form of a frustum of a pyramid or a spheroidal or spherical segment, that is, the portion of a sphere or spheroid between two planes intersecting the sphere. As shown, this portion is in the form of a pyramid frustum 31. The barrel can be fabricated from only two sections 33 and 31 but this appreciably decreases the size of the load which the barrel can efficiently handle and thus is not desirable. However, preferably the barrel is provided with a section 32 intermediate sections 31 and 33 and a section 30 forming a feed and discharge mouth for the barrel. Where the barrel is fabricated with an intermediate section (such as 32) in the form of a pyramidal frustum or spheroidal segment, the load carrying capacity of such a barrel is approximately twice that of a barrel having the same diameter but without an intermediate portion such as 32. These sections are all joined together. The joining may be permanent, such as by welding, riveting, or the like. The various pyramids and pyramidal frustums may be joined by means of removable fastenings such as bolts, clamping rings or the like to permit easy cleaning or replacement of parts. Section 32 can take the form of one or several pyramidal frustums or spherical or spheroidal segments arranged to flare outwardly from the axis of rotation toward the open end of the barrel. As shown, section 32 has the form of a pyramidal frustum. Section 30 can be a cylinder, a pyramidal frustum, or a spherical or spheroidal segment flaring either inwardly or outwardly from the axis of rotation toward the open end of the barrel. As shown, section 31 takes the form of a cylinder.

The term "pyramid" is used broadly herein to include a cone and a spheroidal cap. The frustum-pyramidal portions 31 and 32 are positioned base to base and together form a bi-pyramidal section of the plating barrel. The angle ACB, shown in Fig. 2, should be greater than the angle of repose for the articles to be treated. The line AB is perpendicular to the horizontal from point B on the barrel 5 when the barrel is lowered into the tank in position for treating the articles. The angle EFD, shown in Fig. 2, should be less than the angle of repose for the articles to be treated. The line EF is perpendicular to the horizontal when the barrel is lowered into the tank in position for treating the articles.

The articles to be treated when the barrel is stationary will rest primarily on the lower side of portion 32 and also on the lower side of portions 31 and 33. As the barrel rotates, the articles will tend to rotate with the barrel. It is evident, however, that those parts which are on the lower side of portions 31 and 32 cannot rotate 180° with any part of the barrel because before they reach the top side of the barrel they would have long since passed beyond the angle of repose and rolled back down to the lower side of the barrel. In other words, the lower

side of sections 32 and 31, upon rotating 180°, becomes the top side of the barrel and is turned completely over so that the articles are bound to fall back toward the lower side of the barrel. The work resting on the lower side of section 33 between points C and G might very well remain stationary and not slide downwardly toward the bottom of section 32. However, any given area between points C and G along the bottom section 33, upon rotation of the barrel, changes its angularity so that upon rotation of 180° this portion now becomes substantially vertical and in any event the inclination of portion 33 along line BC is sufficient so that the angle ACB is more than the angle of repose and consequently the articles will roll or tumble downwardly toward the bottom of the barrel.

Each barrel may be provided with a chute 40 which is fixed to, and supported by, bracket 6 so that the chute 40 tilts or swings with its respective barrel 5. The swinging of the barrel and chute from lowered position in the tank to fully raised position is shown in Fig. 5. In the lowered position while the articles are being treated, the load will rest on the bottom of sections 31, 32 and 33. As the barrel 5 is tilted upwardly, the load tends to move toward the mouth 24 of the barrel. If the load were permitted to move toward the mouth 24 of the barrel before the chute 40 reached horizontal position or was inclined downwardly toward the right, as viewed in Fig. 5, the load would jam at the mouth 24 of the barrel and in the depression formed by the bottom side of cylindrical portion 30 and the bottom of the trough 40 in the area designated 41. As the load built up in area 41 it would also tend to jam against brackets 6. To avoid this difficulty the bottom side of barrel portion 31 is arranged so that angle EFD is less than the angle of repose. Consequently as the barrel is raised from lowered position, bottom portion 31 prevents the articles from sliding or tumbling out into cylindrical portion 30 and chute 40 until the chute gets beyond horizontal position. At or shortly after bottom portion 31 reaches horizontal position the load begins to slide by gravity through the mouth of the barrel and down the chute 40 which is now inclined downwardly toward the right, as viewed in Fig. 5.

I claim:

1. In a machine for treating articles in bulk, a rotatable barrel having an open end adapted to receive the articles to be treated, a discharge chute adjacent the open end of the barrel for receiving the articles discharged from the barrel as it is tilted upwardly, a tiltable support for said barrel and chute, said barrel comprising an open cylindrical end portion and a portion adjacent thereto in the form of a frustum of a pyramid flaring outwardly from the cylindrical portion, the bottom of said frustum being approximately parallel to the bottom of said chute whereby the articles are retained in the barrel as it is raised until the chute reaches approximately horizontal position in the upward tilting of the barrel and chute whereupon the articles travel out of the barrel and down the chute.

2. In a machine for treating articles in bulk, a rotatable barrel adapted to receive the articles to be treated comprising a portion in the form of two pyramidal frustums positioned base to base, means for supporting said barrel to rotate approximately about the axis of symmetry of said frustums, said axis being inclined downwardly when the barrel is lowered in article treating

position, a discharge chute adjacent the open end of the barrel with the bottom of the chute inclined at an angle of less than 180° to the axis of rotation of said barrel, said barrel having its end remote from the chute closed, a tiltable support for said barrel and chute whereby when the barrel and chute are tilted upwardly to discharge the work the inclination of the frustum pyramidal portion of the barrel retains the articles in the barrel remote from the junction of the barrel and chute until the chute in the upward tilting of the barrel and chute approximately reaches the position wherein the articles can slide by gravity down the chute without jamming at the junction of the chute and open end of the barrel.

3. In a machine for treating articles in bulk, a foraminated rotatable barrel having one end closed and the other end open, a discharge chute adjacent the open end of the barrel and intersecting the axis of rotation of the barrel for receiving the articles discharged from the barrel as it is tilted upwardly, a tiltable support for said barrel and chute, said barrel comprising a closed symmetrical end portion flaring outwardly from the axis of rotation and toward the open end of the barrel at an angle such that when the barrel is in article treating position the end portion will always have a radially extending area having an angle with the horizontal greater than the angle of repose whereby during the rotation of the barrel the articles in this area will roll toward the bottom of the barrel, said barrel also having another symmetrical portion joined to the above portion and tapering inwardly toward the open end of the barrel so that the area along the bottom of said portion when the barrel is lowered in work treating position forms an angle with the vertical less than the angle of repose whereby when the barrel is tilted upwardly to empty the barrel the articles will remain on the bottom of said latter portion until the chute approximately reaches the position wherein the articles can

slide by gravity down the chute without jamming at the junction of the chute and the open end of the barrel.

4. In a machine for treating articles in bulk, a rotatable barrel adapted to receive said articles to be treated comprising a portion in the form of two pyramidal frustums positioned base to base, a cylindrical portion connected to one of said frustums and forming the open end of the barrel, a pyramidal portion connected to the other pyramidal frustum forming the closed end of the barrel, a tiltable support for said barrel whereby the barrel can be tilted to raise the closed end of the barrel above the open end to discharge said articles, said tiltable support having a portion extending into the open end of the barrel, and bearing means housed within the said barrel serving as the sole means for rotatably mounting the said barrel on the said portion of the tiltable support whereby the said barrel is rotatable about an axis which is the axis of symmetry for said barrel.

5. In a machine for treating articles in bulk, a rotatable barrel adapted to receive said articles to be treated comprising a portion in the form of two pyramidal frustums positioned base to base, a cylindrical portion connected to one of said frustums and forming the open end of the barrel, a pyramidal portion connected to the other pyramidal frustum forming the closed end of the barrel, a tiltable support for said barrel whereby the barrel can be tilted to raise the closed end of the barrel above the open end to discharge said articles, said tiltable support having a bearing member extending into the open end of the barrel along its axis of symmetry, a spider mounted within the said barrel and supporting a second bearing member extending along the axis of symmetry of said barrel, the one bearing member being journaled within the other whereby the barrel is rotatable on the said tiltable support about the axis of symmetry of said barrel.

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