

April 26, 1960

R. R. BINTZLER

2,933,861

CONTINUOUS FEED TUMBLING APPARATUS

Filed May 8, 1958

3 Sheets-Sheet 1

Fig. 1

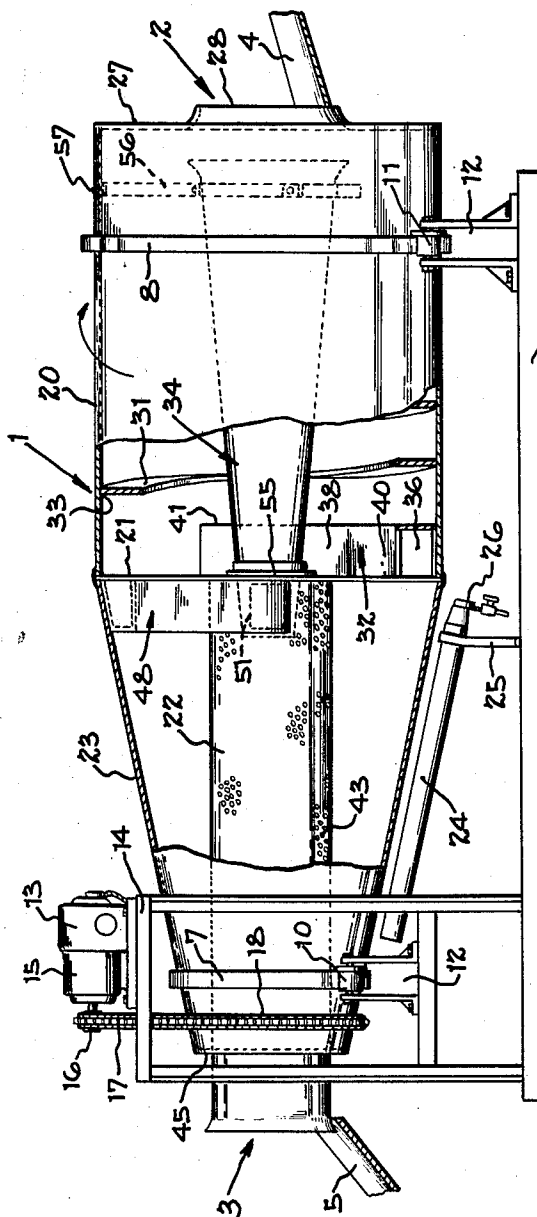
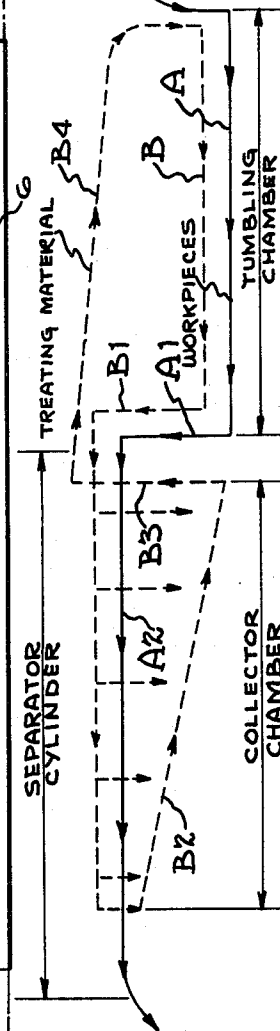


Fig. 7



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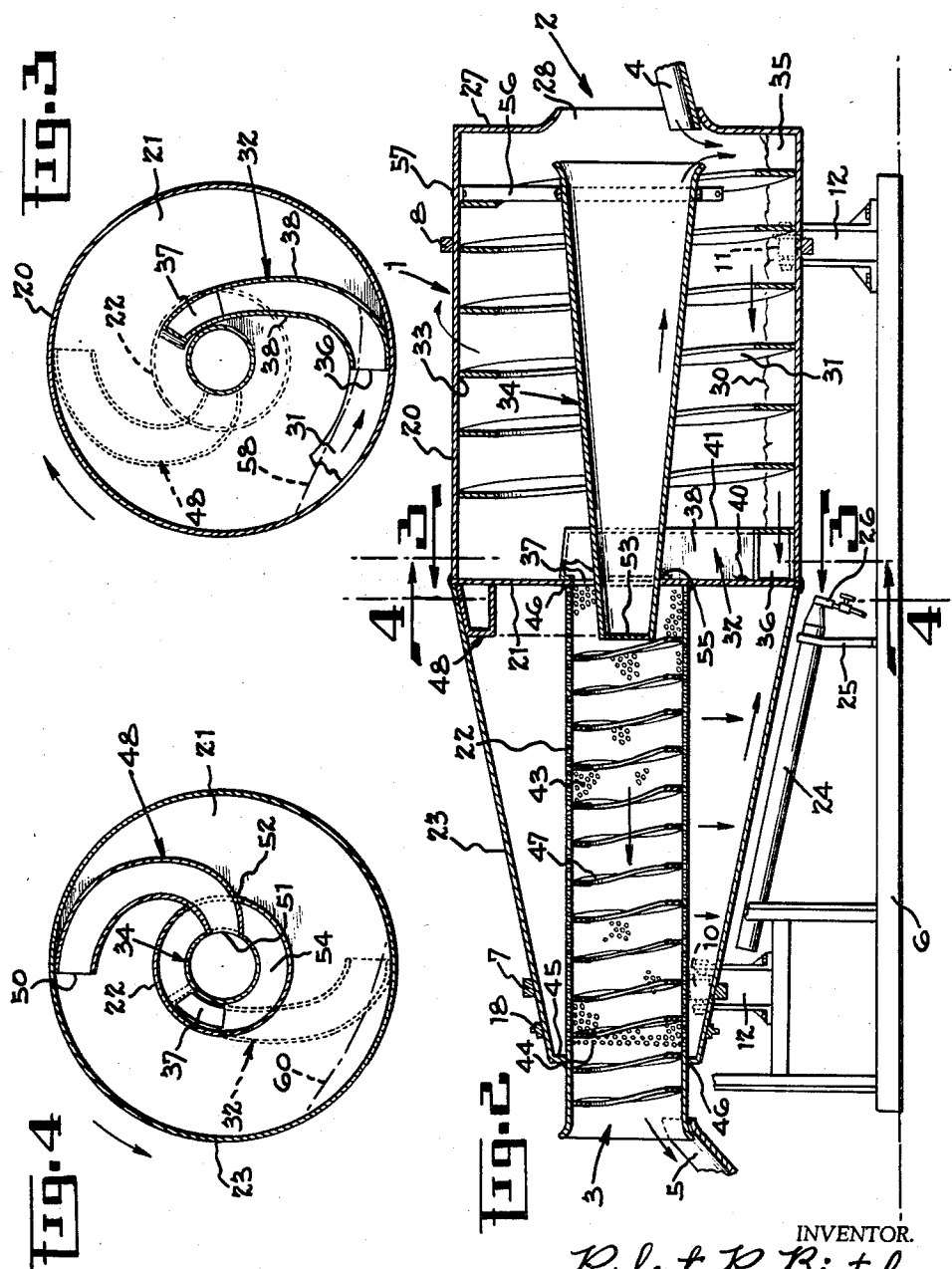
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3 Sheets-Sheet 2



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3 Sheets-Sheet 3

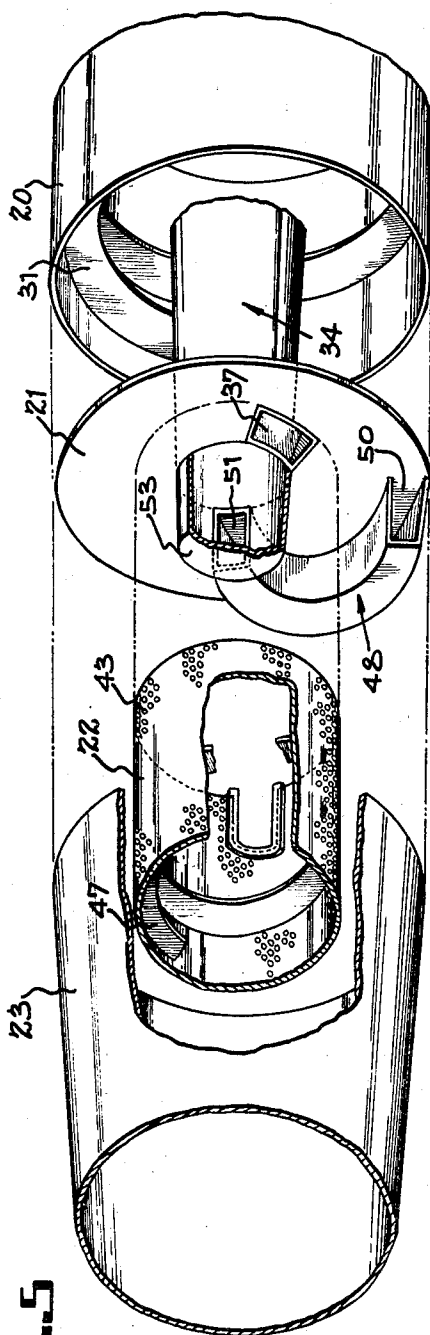


Fig. 5

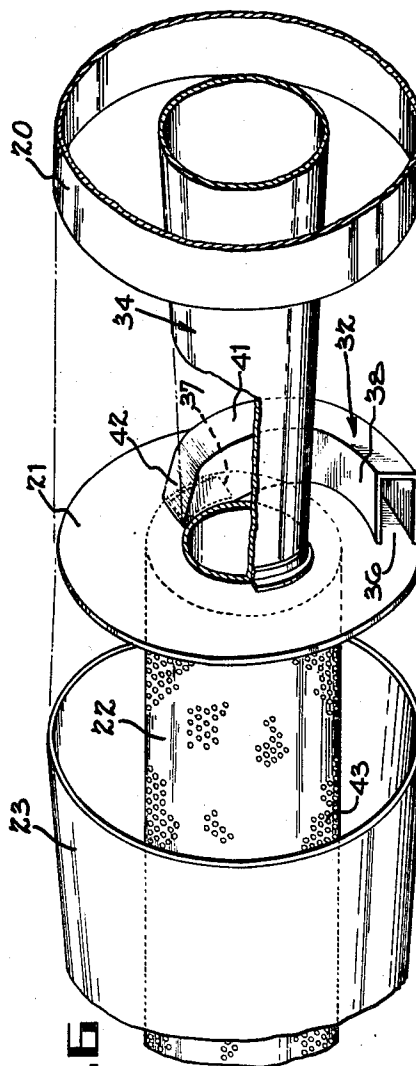


Fig. 6

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CONTINUOUS FEED TUMBLING APPARATUS

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Application May 8, 1958, Serial No. 734,024

9 Claims. (Cl. 51—164)

This invention relates to industrial treating machines in which metal workpieces are subjected to a surface treatment, such as cleaning, polishing or de-burring, by agitation in the presence of a mass of treating material.

In general, a typical tumbling mill comprises a cylindrical tumbling barrel or drum mounted for rotation about a horizontal axis and arranged to confine the mass of treating material and workpieces, such as metal parts. During rotation of the drum, the parts and treating material are agitated together as a commingled mass, causing the treating material to effect a scrubbing action with respect to the various surfaces of the metal parts. A machine of this general character is disclosed in the patent to Nathan Ransohoff, No. 2,999,832, issued on October 13, 1942. The machine of the prior patent is of the intermittent or batch treatment type, that is, a mass of loose treating material and a batch of metal parts are tumbled in the drum for a predetermined period of time, then the batch of parts is discharged from the machine in finished condition. In order to bring about the batch operation, the machine is reversible, being arranged to retain the parts in the tumbling barrel during rotation in a tumbling direction and to discharge them only during rotation in a reverse or discharge direction. During discharge rotation, the treating material is separated from the discharging parts to be returned to the tumbling barrel for treating a subsequent batch of parts.

It has been one of the primary objectives of the present invention to provide a tumbling machine for the continuous advancement of the work through a tumbling chamber for treatment, and through a separator for discharge as a continuous stream in finished condition, while the mass of loose treating material concurrently is screened from the discharging parts and recirculated back to the tumbling chamber for reuse. In other words, the present apparatus is arranged to provide a continuous unidirectional flow of work parts through the machine, accompanied with continuous screening and recycling of the treating material in a closed circuit, as distinguished from the prior batch-type operation.

The present apparatus is intended for subjecting metal parts to several different kinds of treatment, depending upon the nature of the work. For example, certain classes of work, such as castings or machined parts, may require an abrasive treatment in which burs or roughness are removed by abrasive action from the work surface; other classes of work may require a cleaning or polishing treatment. In tumbling work requiring an abrasive action, such as de-burring, the machine is charged with an appropriate hard abrading material, which may consist of metal slugs, stars, or fragments of stone. On the other hand, where a cleaning or polishing action is required, the machine may be charged with a non-abrasive material, such as wood, saw dust, or similar material suited to the type of work being treated.

In treating the parts with heavy abrasives, the abrasive particles are readily separated from the workpieces and recirculated through the machine; however, saw dust and

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similar light-weight materials are more difficult to handle. By way of example, when the parts are charged into the machine in wet condition for polishing or cleansing with saw dust, the moisture is absorbed by the saw dust; consequently, the moist particles have a tendency to adhere to one another and to form lumps or cakes. The moist particles also adhere to the machine surfaces and to the treated parts so as to interfere with the screening process.

It is therefore another objective of the invention to provide a tumbling apparatus arranged to advance the metal parts and treating material, particularly saw dust or the like, in a positive manner through the apparatus, combined with a separator arranged to efficiently separate all of the treating material from the workpieces as they flow toward the discharge end of the apparatus.

A further objective has been to provide an apparatus in which the separator structure has the double function of screening the saw dust from the polished parts, and also of driving absorbed moisture from the saw dust in a rapid efficient manner by heating the material during recycling, thereby to improve the overall efficiency of the machine.

Briefly, an apparatus constructed according to the present invention comprises a barrel or drum having a tumbling compartment at one end, in which the tumbling operation is carried out, and a separating section in which the treating material is separated from the treated parts, collected and recirculated back to the tumbling compartment. The separating section comprises a cylindrical screen or perforated cylinder having a diameter substantially smaller than the tumbling chamber and surrounded by a cone-shaped collector chamber providing a surface which slopes downwardly toward the end of the tumbling chamber; the sloping surface causes the separated treating material to gravitate back toward the end of the tumbling chamber for recirculation, while the treated parts advance in the opposite direction along the separator cylinder for discharge. The tumbling chamber and separator screen each include an internal helix for conveying the metal parts and treating material longitudinally through the machine.

In order to elevate the treated workpieces from the periphery of the tumbling chamber to the separator cylinder, which is substantially smaller in diameter, a generally convolute discharge scoop extends from the trailing end of the helix and communicates with the end of the separator cylinder. During rotation of the unit, the scoop, upon each revolution, elevates a quantity of the treated parts and the material from the tumbling chamber to the separator cylinder. A return scoop communicates with the lower end of the cone-shaped collector chamber, and in a similar manner, periodically elevates the screened material from the collector to a conical return tube which advances the treating material back to the charging end of the tumbling chamber for reuse. These components advance the parts and material in a substantially positive manner through the apparatus as a consequence of its rotation.

During rotation, the parts to be treated are introduced continuously into the charging end of the tumbling chamber to be agitated and advanced with the mass of treating material which is maintained at a predetermined level within the chamber; the parts, together with the surrounding material are then elevated to the separator cylinder for advancement of the parts in the same direction to the discharge end of the separator cylinder while the separated treating material is separated and recycled in the opposite direction back to the charging end of the tumbling chamber.

When the parts are cleaned or polished with saw dust or the like, as outlined above, the conical collector cham-

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ber is heated by an external heat source to a temperature sufficiently high to dehydrate the moist saw dust. The particles of moist saw dust screened from the parts thus drop from the separator cylinder into contact with the heated, sloping surface of the collector chamber. It has been found that the particles readily flow down the heated surface by reason of its combined slope and rotary motion, the material being thoroughly dried before it is elevated by the return scoop and conveyed by the conical return tube back to the charging end of the tumbling chamber. The parts advancing through the separator cylinder are also exposed to the heat within the collector chamber to aid in drying and dislodging the adhering particles. By virtue of the thorough dehydration of the saw dust and positive feeding action provided by the apparatus, the surfaces of the entire machine are kept free of adhering saw dust, while the treated parts are discharged with the saw dust completely separated from them.

The various features and advantages of the invention will be more clearly apparent to those skilled in the art from the following description taken in conjunction with the drawings.

In the drawings:

Figure 1 is a side elevation of a tumbling mill embodying the invention, the machine being partially broken away to show the arrangement of certain internal parts.

Figure 2 is a longitudinal sectional view of the machine.

Figure 3 is a cross sectional view taken along line 3—3 of Figure 2, illustrating the arrangement of the discharge scoop which leads from the tumbling chamber to the screening cylinder.

Figure 4 is a sectional view taken along line 4—4 of Figure 2, illustrating the return scoop leading from the collector chamber for recirculating the screened treating material back to the tumbling chamber.

Figure 5 is an exploded view looking toward the discharge end of the machine, further illustrating the relationship of the collector chamber, separator cylinder and return scoop.

Figure 6 is an exploded view looking toward the charging end of the machine, further illustrating the relationship of the tumbling chamber and discharge scoop.

Figure 7 is a flow diagram illustrating the direction of advancement of the workpieces and related circuit of loose treating material during operation of the machine.

General arrangement

The structure selected to illustrate the principles of this invention, as shown generally in Figure 1, comprises a tumbling barrel or drum, indicated generally at 1, which is rotated as a unit about a horizontal axis at a relatively slow speed to provide the tumbling action. The workpieces to be treated are fed into the charging end 2, then the pieces advance longitudinally through the machine and flow from the discharge end 3 in finished condition. In the example illustrated, the parts are introduced into the charging end by way of a stationary charging chute 4; the finished parts, which flow from the discharge end, are carried off by a discharge chute 5.

The tumbling barrel 1 preferably is of welded construction and its opposite ends are supported for rotation above a frame-work 6 fabricated from structural iron. The opposite end portions of the tumbling barrel 1 are provided with tracking rings 7 and 8, riding upon respective sets of flanged rollers 10—10 and 11—11 which are journaled in bearing brackets 12 carried by the frame-work 6. The tracking rings 7 and 8 preferably are welded to the external surface of the tumbling barrel; the respective rollers of each set are spaced apart transversely to stabilize the tumbling barrel with respect to the frame-work 6.

The tumbling barrel is rotated by a motor 13 mounted

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upon a support frame 14 rising from the frame-work 6. The motor 13 preferably is of the gear head type, having a gear reduction unit 15 to provide the desired speed of barrel rotation. The motor drive comprises a motor sprocket 16 meshing with a sprocket chain 17 passing around a large sprocket 18, which is welded to the tumbling barrel adjacent the tracking ring 7. The motor driving system rotates the barrel as a unit in the direction indicated by the arrow during operation of the machine.

Described generally with reference to Figure 2, the tumbling barrel 1 comprises a tumbling chamber 20, an intermediate baffle or partition 21, a separator cylinder 22 projecting end-wisely from the tumbling chamber, and a cone-shaped collector chamber 23 surrounding the separator cylinder. These components are all joined together in coaxial relationship for rotation as a unit. In order to utilize the collector chamber as a saw dust dehydrator, an elongated heating element 24, preferably comprising a lineal gas burner, is mounted beneath the collector chamber and arranged to project blast flames upon the external surface of the chamber. The burner is supported by one or more brackets 25 and includes a suitable control valve and mixing chamber 26 of conventional design for regulating the dehydration temperature. When the parts are treated with non-absorbent material, such as hard abrasives which do not require drying, the burner is shut down during operation of the machine.

Tumbling section

As shown in Figure 2, the tumbling chamber 20 includes an end wall 27 having a charging opening 28 located at the center of rotation through which the loading chute 4 charges the work. The end wall surrounding the opening confines the mass of treating material at a predetermined level as indicated at 30. The barrel is provided with a conveyor vane or helix 31 which spirals from the end wall 27 to a discharge scoop, indicated generally at 32, mounted upon the intermediate wall 21. The spiral vane comprises metal plates welded as at 33 to the internal surface of the tumbling chamber; the lead of the vane, during rotation of the tumbling barrel in the direction indicated, provides advancement of the parts from the forward wall 27 to the scoop 32, which elevates and transfers the parts and treating material to the separator cylinder 22.

As described later in detail, the treating material is returned continuously to the charging end of the tumbling chamber by a conical return tube indicated generally at 34. The internal surface of the return tube slopes downwardly toward the charging end of the machine, such that the material flows from the end of the cone to the space 35 delineated by the leading end of the spiral vane and the end wall 27. It will be noted that the end of the charging chute 4 also communicates with the charging space 35, such that a continuous stream of treating material and a continuous supply of metal parts concurrently are fed by the cone and chute to the charging end of the rotating barrel for advancement longitudinally by the helix.

As the parts and treating material approach the intermediate wall 21, they are advanced in a positive manner by the spiral vane into the discharge scoop 32. As best shown in Figure 3, scoop 32 is of a convolute shape, providing an enclosed ramp having a receiving end communicating with the trailing end of the spiral vane as at 36. The delivery end of the scoop leads to an opening 37 in the intermediate wall (Figures 2 and 5) which communicates with the end of the separator cylinder 22.

In the example illustrated, the scoop comprises spaced side walls 38—38 welded as at 40 to the intermediate wall 21, the outer ends of the side walls being joined by a top wall 41. The top wall preferably is inclined as at 42 (Figure 6) adjacent the opening 37 to facilitate the advancement of the parts and treating material to

the separator screen. Upon each rotation of the tumbling barrel, as indicated in Figure 3, the quantity of parts and material at the trailing end of the vane passes into the receiving end of the scoop; during continued rotation from the position shown, the parts and material are skidded along the curved surface of the scoop, elevated to the opening 37, and finally delivered into the end of the separator cylinder 22.

Separating section

In the example illustrated, the separator cylinder 22 is fabricated from sheet metal, which is perforated as at 43 to allow the treating material to pass to the cone-shaped collector chamber 23 as it is separated from the metal parts. The perforations preferably extend for the full length of the collector chamber and terminate as at 44 (Figure 2) adjacent the end wall 45 of the collector chamber. The respective opposite ends of the separator cylinder are welded as at 46 to the intermediate wall 21 and end wall 45.

In order to advance the parts and treating material, the separator cylinder includes a spiral vane 47, similar to the vane 31, of the tumbling chamber and leading in the same direction. The parts and material are thus advanced continuously from the intermediate wall toward the discharge end 3 of the machine during rotation of the tumbling barrel. The treating material is progressively screened from the parts during advancement along the separator cylinder and drops by gravity to the sloping surface of the collector chamber 23. By reason of the rotation of the chamber and its sloping surface, the separated material gravitates toward the intermediate wall 21, where it is picked up by the return scoop indicated at 48.

As best shown in Figure 4, return scoop 48 is generally similar to the discharge scoop 32, having a receiving end 50 residing adjacent the periphery of chamber 22, and having a delivery end 51 communicating with the conical return tube 34. It will be noted in Figure 4, that the scoop 48 is welded directly to the intermediate wall 21 and that its upper delivery end 51 passes through an opening 52 of the separator cylinder 22 for direct communication with the return tube 34. During each rotation of the barrel, the receiving end 51 of the scoop passes through the mass of material accumulated adjacent the intermediate wall; during continued rotation, the scoop elevates the material and finally delivers it to the return tube 34 for advancement to the receiving end of the barrel, as previously indicated at 35.

As shown in Figure 2, the adjacent ends of the separator cylinder 22 and return tube 34 are telescopically interfitted, the end of tube 34 being closed off by a wall 53 to prevent intermingling of the workpieces and treating material. The related diameters of the two tubes delineate an annular space 54 (Figure 4) providing clearance for the parts passing from the discharge scoop 32 into the separator cylinder. The rearward end of the return tube 34, which passes into the separator cylinder, is supported by the intermediate wall 21, the tube being welded as at 55 to the wall opening through which it passes. The forward end of the return tube 34 is supported by a spider 56 having radial arms secured as at 57 to the periphery of the tumbling chamber.

Operation

When the machine is set up for treating a given type of work, a suitable quantity of saw dust or other treating material is introduced into the tumbling chamber to provide an operating level, previously indicated at 30. The stream of parts as indicated in Figure 2, is charged into the chamber by way of the chute 4 either manually or by conveyor equipment. The flow of parts and treating material through the tumbling chamber is indicated by the arrow A in Figure 7, while the corresponding flow of treating material is indicated by the arrow B in broken

lines. At the trailing end of the spiral vane, treated parts and treating material are elevated to the separator cylinder 22 as shown by the vertical arrows A1 and B1 (discharge scoop 32). This action is illustrated in Figure 3 in which the quantity of parts and material are indicated at 58.

During advancement along the separator cylinder 22, the screened particles of treating material drop by gravity as indicated, flow downwardly along the sloping surface of the cone-shaped collector chamber 23 as indicated by the arrow B2; the screened material then is elevated to the return tube 34 (return scoop 48) as indicated by the arrow B3. This action is shown in Figure 4, in which the screened material (or dehydrated saw dust) is indicated at 60. Thereafter, the material gravitates longitudinally along the return tube as indicated by the arrow B4 in its recycling circuit back to the charging end of the tumbling chamber, while the finished parts advance in the opposite direction to the discharge end, as indicated by the arrow A2.

When saw dust is used in treating the workpieces, the gas burner 24 is placed in operation and the moist saw dust is dehydrated as it gravitates along the collector chamber, as indicated by the arrow B2. As noted earlier, the heat which is confined in the collector drum, also acts upon the parts which are advancing along the separator cylinder 22. Any moist saw dust particles which may adhere to the parts or to the separator cylinder are dehydrated, at least partially, and dislodged during longitudinal motion of the parts along the separator; consequently, there is no opportunity for moist particles to build up and clog the apertures of the separator during continued operation. It has been found that the combined separating and dehydration action also prevents the saw dust from adhering to the collector chamber with attendant scorching or overheating of the material. Since the dehydrated saw dust retains a certain amount of the absorbed heat upon being returned to the tumbling chamber, the cleaning and drying action is accelerated and the efficiency of the machine is therefore improved.

It will be noted that the discharge scoop 32 and return scoop 48 both provide a one-way transfer action, that is, the scoops are effective to transfer the parts and material only during rotation of the machine in the direction indicated. Therefore, if desired, the present apparatus may be operated as a batch-type machine without any structural changes, other than to equip the apparatus with a reversible motor 13 for driving the machine in a direction opposite to that indicated. Since the scoops are ineffective during reverse rotation, the parts and material may be agitated for a predetermined time period in the tumbling chamber. Thereafter, the motor is reversed after a treatment period, causing normal operation to be resumed.

Having described my invention, I claim:

1. A treating apparatus for tumbling a stream of workpieces with loose recycled treating material comprising, a tumbling drum mounted for rotation about a generally horizontal axis and having a charging end, separator means projecting outwardly from the opposite end of said drum along said axis, discharge means interconnecting the tumbling drum and separator means for transferring workpieces and treating material from the tumbling drum to the separator means during rotation thereof, said separator means having a discharge opening and having means for screening the treating material from the workpieces while advancing the workpieces toward said discharge opening, a return device adapted to advance the screened treating material toward the charging end of the tumbling drum, and return means interconnecting the separator means and return device for transferring the screened treating material to the return device for advancement toward the charging end of the tumbling drum during rotation thereof, whereby the workpieces are introduced into the charging end of the tum-

bling drum, tumbled, then transferred to said separator means and discharged therefrom while the treating material is screened and recycled in a closed circuit between the tumbling drum and separator means.

2. A treating apparatus for tumbling a stream of workpieces with loose recycled treating material, comprising a tumbling drum mounted for rotation about a generally horizontal axis and having a charging end, separator means projecting outwardly from the opposite end of said drum along said axis, discharge means interconnecting the tumbling drum and separator means for transferring workpieces and treating material from the tumbling drum to the separator means during rotation thereof, said separator means having a discharge opening and having means for screening the treating material from the workpieces while advancing the workpieces toward said discharge opening, a return tube mounted within the tumbling drum along said axis, said tube having a discharge end adjacent the charging end of the tumbling drum, and return means interconnecting the separator means and return tube for transferring the screened treating material to the return tube during rotation thereof, whereby workpieces are fed into the charging end of the tumbling drum, tumbled in the presence of the treating material and discharged while the treating material is screened, transferred to the return tube and recycled to the charging end of the tumbling drum in a closed circuit.

3. A treating apparatus for tumbling a stream of workpieces with loose recycled treating material comprising, a tumbling drum mounted for rotation about a generally horizontal axis and having a charging end, a separator projecting outwardly from said drum along said axis, discharge means interconnecting the tumbling drum and separator for transferring workpieces and treating material from the tumbling drum to the separator during rotation thereof, said separator having a discharge end and having means for screening the treating material from the workpieces while advancing the workpieces toward said discharge end, a collector chamber surrounding the separator for collecting the screened treating material, a heating element associated with the collector chamber for heating the same to a dehydration temperature, a return device adapted to advance treating material toward the charging end of the tumbling drum, and return means interconnecting the collector chamber and return device for transferring the screened treating material to the return device for advancement toward the charging end of the tumbling drum during rotation thereof, whereby workpieces are fed into the charging end of the tumbling drum, tumbled in the presence of the treating material and discharged while the treating material is screened therefrom, dehydrated in said collector chamber and recycled to the charging end of the tumbling drum.

4. A treating apparatus for tumbling a stream of workpieces with loose recycled treating material comprising, a tumbling drum mounted for rotation about a generally horizontal axis and having a charging end, a separator projecting outwardly from said drum, discharge means interconnecting the tumbling drum and separator for transferring workpieces and treating material from the tumbling drum to the separator during rotation thereof, said separator having a discharge end and having means for screening the treating material from the workpieces while advancing the workpieces toward said discharge end, a collector chamber surrounding the separator for collecting the screened treating material, a return tube mounted within the tumbling drum and having a discharge opening adjacent the charging end of the tumbling drum, a heating element associated with the collector chamber for heating the same to a dehydration temperature, and return means interconnecting the collector chamber and return tube for transferring the screened treating material to the return tube during rotation

thereof, whereby workpieces are fed into the charging end of the tumbling drum, tumbled in the presence of the treating material and discharge, while the treating material is screened therefrom, dehydrated in said collector chamber and recycled to the charging end of the tumbling drum.

5. A treating apparatus for tumbling a stream of workpieces with loose recycled treating material comprising, a tumbling drum mounted for rotation about a generally horizontal axis and having a charging end, separator means projecting outwardly from the opposite end of said drum along said axis, discharge means interconnecting the tumbling drum and separator means for transferring workpieces and treating material from the tumbling drum to the separator means during rotation thereof, said separator means having a discharge opening and having means for screening the treating material from the workpieces while advancing the workpieces toward said discharge opening, a collector chamber extending along said axis and surrounding the separator means for collecting the screened treating material and having an internal surface sloping downwardly toward the end of the tumbling drum, a return tube mounted within the tumbling drum along said axis, said tube having a discharge opening adjacent the charging end of the tumbling drum and having an internal surface sloping downwardly toward the said discharge opening, and return means interconnecting the collector chamber and return tube for transferring the screened treating material to the return tube during rotation thereof, whereby workpieces are fed into the charging end of the tumbling drum, tumbled in the presence of the treating material and discharged, while the treating material is screened therefrom and recycled to the charging end of the tumbling drum.

6. A treating apparatus for tumbling a stream of workpieces in the presence of loose, recycled treating material comprising, a tumbling drum mounted for rotation about a substantially horizontal axis, said drum having a charging end for receiving the stream of workpieces and having an internal helix arranged to advance the workpieces longitudinally during rotation of said drum, screening means extending outwardly from said drum substantially along said axis and having a discharge end, discharge means for transferring workpieces and treating material from the tumbling chamber to the screening means during rotation of said drum, said screening means having an internal helix for advancing the workpieces toward said discharge end and separating the treating material therefrom during rotation of the screening means, collector means surrounding the screening means and collecting said separated treating material, and return means transferring the separated material from the collector means, said return means adapted to advance the separated material toward the charging end of the tumbling chamber during rotation of the drum, whereby a continuous stream of workpieces is fed into the charging end of the tumbling chamber, tumbled in the presence of the treating material and discharged while the treating material is recycled from the collector chamber back to the tumbling chamber.

7. A treating apparatus for tumbling a stream of workpieces with loose recycled treating material comprising, a tumbling drum mounted for rotation about a generally horizontal axis and having a charging end, said drum having a partition delineating the opposite end thereof, an internal helix disposed within the tumbling drum for advancing workpieces and treating material from said charging end toward said partition during rotation of the tumbling drum, a discharge scoop mounted adjacent said partition and having a receiving end disposed adjacent the internal surface of the tumbling drum, said internal helix having a trailing end communicating with said receiving end for advancing the workpieces and treating material thereto, a screening cylinder extending outwardly from said partition along said axis, said discharge scoop having

a delivery end communicating with said screening cylinder for delivering the treating material and workpieces thereto during rotation of the apparatus, said screening cylinder advancing the workpieces while screening the treating material therefrom, a collector chamber surrounding the screening cylinder for collecting the screened treating material, a return tube extending from said partition toward the charging end of the tumbling drum along said axis, said tube having a discharge end adjacent the charging end of the tumbling drum, and a return scoop interconnecting the collector chamber and return tube for transferring the screened material to said return tube, said return tube conveying the screened treating material to the charging end of the tumbling drum during rotation thereof to be recycled with a stream of parts fed into the charging end of the tumbling drum.

8. In a rotatable tumbling machine for treating a continuous stream of workpieces in the presence of loose treating material, said tumbling machine having a charging end, an apparatus for separating the treating material from the workpieces and recycling the same back to the tumbling machine, said apparatus comprising, a separator cylinder extending outwardly from said tumbling machine substantially along the axis of rotation thereof and having a discharge end, an internal helix in said separator cylinder leading to said discharge end, discharge means interconnecting the separator cylinder and tumbling machine for transferring workpieces and treating material to the separator cylinder for advancement by said internal helix to the discharge end of the separator cylinder, said separator cylinder having apertures for screening the treating material from the workpieces while advancing the same, a collector chamber extending outwardly from the tumbling machine and surrounding the separator cylinder for collecting said screened treating material, said collector chamber having an internal wall which slopes downwardly toward the tumbling machine for advancing the screened treating material back to the tumbling machine, a return tube extending along said axis of rotation from the collector chamber toward the charging end of the tumbling machine, and a return scoop interconnecting the collector chamber and return tube for transferring the screened treating material to the return tube, said return tube having an internal surface which slopes

downwardly toward the discharge end of said tube, whereby the treating material is recycled continuously from the collector chamber back to the charging end of the tumbling machine during rotation thereof.

9. In a rotatable tumbling machine for treating a continuous stream of workpieces in the presence of loose treating material, said tumbling chamber having a charging end, an apparatus for separating the treating material from the workpieces and recycling the same back to the tumbling machine, said apparatus comprising, a separator cylinder extending outwardly from said tumbling machine substantially along the axis of rotation thereof and having a discharge end, an internal helix in said separator cylinder leading to said discharge end, a discharge scoop interconnecting the separator cylinder with the tumbling machine for transferring workpieces and treating material from the tumbling machine to the separator cylinder for advancement by said internal helix to the discharge end of the separator cylinder, said separator cylinder having apertures for screening the treating material from the workpieces while advancing the same, a collector chamber extending outwardly from the tumbling machine and surrounding the separator cylinder for collecting said screened treating material, said collector chamber having an internal wall which slopes downwardly toward the tumbling machine for advancing the screened treating material back to the tumbling machine, a heating element associated with the collector chamber for heating the surface thereof to a dehydration temperature, whereby the screened treating material is dehydrated during advancement toward the tumbling machine, a return tube extending along said axis of rotation from the collector chamber toward the charging end of the tumbling machine, and a return scoop interconnecting the collector chamber and return tube for transferring the dehydrated treating material to the return tube, whereby the dehydrated treating material is recycled continuously from the collector chamber to the charging end of the tumbling machine during rotation thereof.

References Cited in the file of this patent

UNITED STATES PATENTS

1,571,076	Warren	Jan. 26, 1926
2,359,944	Schummer	Oct. 10, 1944