March 6, 1945. F. C. HOFFMAN 2,370,792

TUMBLING MECHANISM

Filed Feb. 9, 1943 2 Sheets-Sheet 1

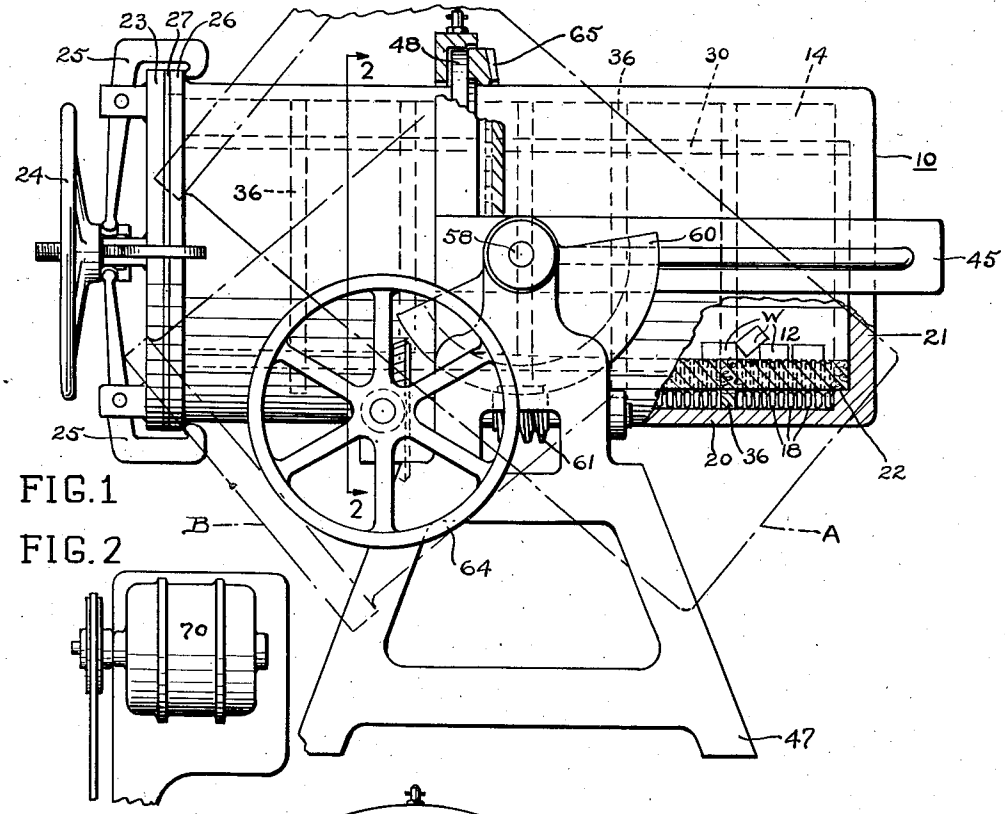
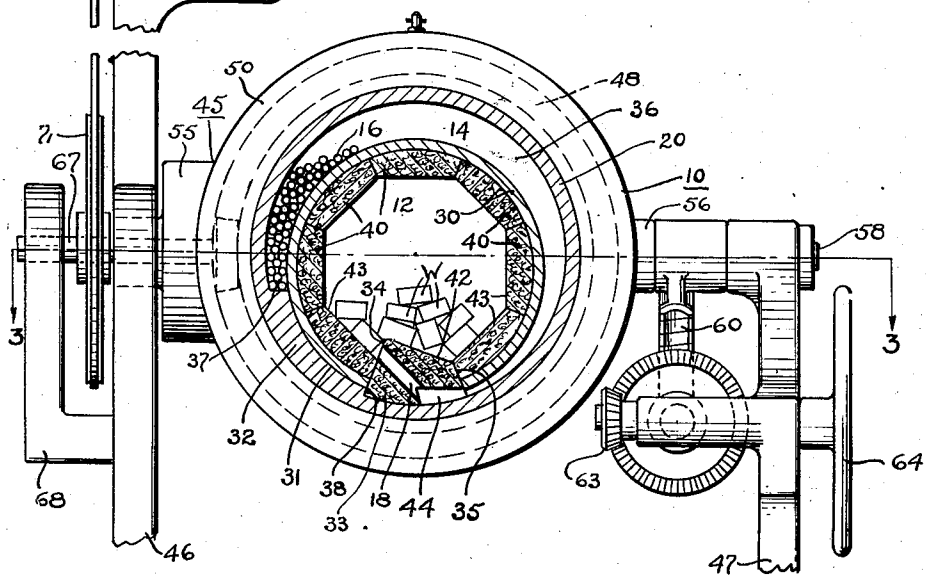


FIG. 1

FIG. 2



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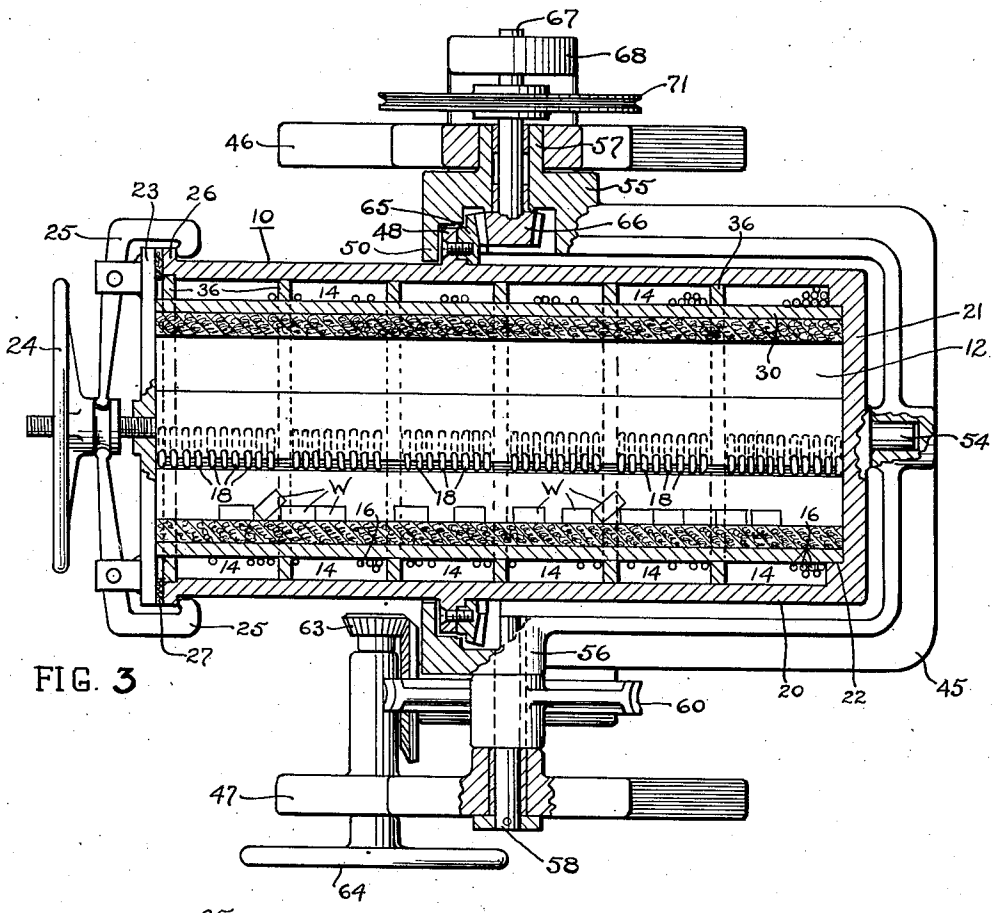


FIG. 3

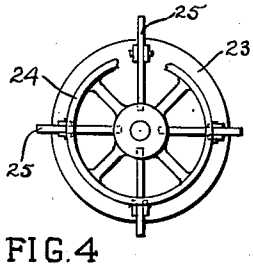


FIG. 4

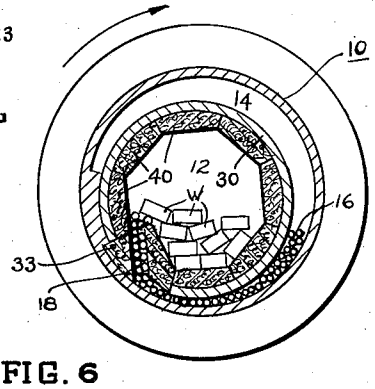


FIG. 6

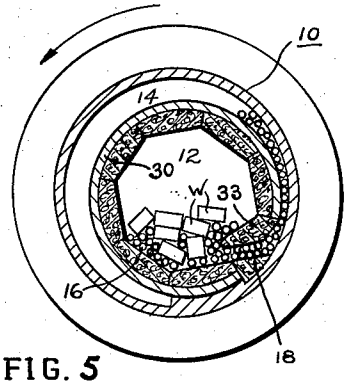


FIG. 5

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TUMBLING MECHANISM

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Application February 9, 1943, Serial No. 475,293

7 Claims. (Cl. 51—164)

This invention relates to tumbling mechanisms and comprises all of the features of novelty herein disclosed.

The removal of flash, scale, corrosion, dirt and other extraneous material from work pieces such as small castings and small forgings, is usually accomplished by placing a quantity of these work pieces together in jumbled relation with a large number of small tumbling members in a tumbling barrel and thereafter rotating this barrel until the extraneous material is removed from the work. Heretofore, after emptying a tumbling barrel at the completion of a tumbling operation, the work pieces had to be sorted from the tumbling members and from the accumulated dirt and scale, after which the tumbling members had to be sorted from the dirt and scale and then returned to the tumbling barrel for the next tumbling operation. These sorting operations and the subsequent replacement of the tumbling members in the tumbling barrel before the next tumbling operation frequenty consume as much time as the tumbling operation, and this loss of time between tumbling operations seriously retards production.

It is therefore an object of this invention to provide an improved tumbling mechanism which sorts work pieces from tumbling members at the completion of a tumbling operation.

Another object is to provide a tumbling barrel of great simplicity and low cost wherein tumbling members in this barrel are separated from the work pieces at the completion of a tumbling operation and are retained within the tumbling barrel when the work pieces are emptied from this barrel.

To these ends and also to improve generally upon devices of this character, the invention consists in the various matters hereinafter described and claimed. In its broader aspects, the invention is not necessarily limited to the specific construction illustrated in the accompanying drawings in which

Figure 1 is a side elevation of my improved tumbling barrel;

Figure 2 is a fragmentary cross section taken substantially along the line 2—2 of Figure 1;

Figure 3 is a longitudinal sectional view taken substantially along the line 3—3 of Figure 2 and having parts broken away to clarify the construction;

Figure 4 is an end view of the barrel closure mechanism;

Figure 5 is a cross sectional view through the tumbling barrel and illustrating the discharge of the tumbling elements into the tumbling chamber at the start of a tumbling operation; and

Figure 6 is a cross sectional view through the tumbling barrel and illustrating how the tumbling elements are separated from the work pieces and retained apart from the tumbling chamber after a tumbling operation.

Generally stated, I have provided a rotatable tumbling barrel 10 having an inner work tumbling chamber 12 about which peripherally extends a series of successive C-shaped or arcuate outer chambers 14 that are arranged to receive tumbling elements, such as tumbling balls 16. Spaced passages 18, extending from one end of each C-shaped chamber 14 into the tumbling chamber 12, are each of a size to provide passage only for the tumbling elements 16 or only for the work pieces W whichever are smaller. When the tumbling elements are the smaller as will usually be the case and when the barrel is rotated in one direction, the tumbling elements empty from the chambers 14 through the passages 18 into the tumbling chamber 12 and intermingle in jumbled relation with the work pieces W to produce a tumbling operation, and when the barrel is rotated in the opposite direction, the tumbling elements 16 separate from the work pieces and move back through these passages into the chambers 14 where they remain pocketed until the next tumbling operation. As illustrated, each of the chambers 14 extends more than half-way around the tumbling chamber 12 so that the tumbling elements cannot move back into the tumbling chamber while the barrel is being rotated in a direction to collect and pocket these elements in the chambers 14.

In the illustrated embodiment, a hollow outer member has a generally circular outer wall 20 closed at one end by a bottom wall 21 having an eccentric counterbore 22, and a cover 23 is removably secured against the open end of the barrel by a handwheel 24 which is threaded on a stud secured to the cover and which operates a series of clamping arms 25 pivotally supported by cover brackets. The inner ends of these clamping arms fit within a groove in the handwheel hub, and hooked outer ends of these clamping arms 25 overlie and removably clamp against an annular flange 26 on the wall 20. A sealing washer 27 may be provided between the cover and the flange 26 to prevent leakage if a liquid is maintained in the barrel during a tumbling operation.

A hollow inner member or open ended annular shell 30 is seated at its inner end in the counter-

bore 22, and is also longitudinally seated against an arcuate surface 31 coextensive with a portion of this counterbore and formed on a radially inward projection 32 of the wall 20. The shell 30 has a longitudinally extending cut-out portion through which projects a keystone-shaped block 33 matingly seated against the inner surface of the wall 20 and having substantially radially disposed shell engaging faces 34 and 35. The shell 30 is also peripherally supported by a series of spaced crescent-shaped cross partitions or baffles 36 that externally seat against the inner surface of the wall 20 and which at one end abut against the block face 35 and at the other end abut against a shoulder 37 on the wall projection 32. These baffles also separate the successive C-shaped ball receiving chambers 14. The shoulder 37 in co-operation with the wall 20, baffles 36 and shell 30 closes one end of each chamber 14 so that the tumbling elements 16 may be pocketed between tumbling operations as shown in Figure 2. The block face 34 locates against a shoulder 38 on the wall projection 32, and the end of the block 33 adjacent to the bottom of the tumbling barrel is stepped to extend into the counterbore 22.

An arcuate series of consecutively abutting keystone-shaped blocks 40 matingly seat against the curved inner face of the shell 30, and two of these blocks 40 also interfit in similar keystone relation against the block 33. The blocks 33 and 40, which may be composed of a hard wood or a suitable molded tough fibrous material such as "Textolite," are respectively provided with flat inner faces 42 and 43 that co-operatively form a multi-sided tumbling chamber having angularly disposed sides which aid in turning and tumbling work pieces over each other and over the tumbling balls 16 as the tumbling barrel is rotated. The end face 34 of the block 33 projects radially inwardly beyond the adjacent block face 43 and provides a shoulder from which the spaced passages 18 angularly extend into spaced block recesses 44 each of which opens into an end of one of the chambers 14. I preferably have the bottom of each passage 18 merge with or coextensive with the adjacent face 43 so that the tumbling balls may freely feed from the tumbling chamber into the ball receiving chambers 14 when the tumbling barrel is rotated as shown in Figure 6.

The tumbling barrel 10 is supported for rotation about a longitudinal axis by a cradle 45 supported for tiltable movement above a transverse axis by a pair of upright frames 46 and 47 so that the tumbling barrel may be tilted to a loading position A, a discharge position B and to an intermediate substantially horizontal position for a tumbling operation. A peripherally extending annular flange 48 on an intermediate portion of the tumbling barrel 10 is journalled within an annular housing 50 of the cradle; and cradle side arms, rearwardly extending from this housing, are connected by a cross arm within which is journalled a stub shaft 54 extending from the bottom of the tumbling barrel coaxially of the annular flange 48. The annular housing 50 has diametrically opposed bosses 55 and 56 respectively adjacent to the upright frames 46 and 47. The boss 55 is provided with a reduced sleeve extension 57 journalled in the frame 46; and a shaft 58, secured in and laterally projecting from the boss 56 coaxially of the sleeve extension 57, is journalled in the upright frame 47. A worm wheel segment 60, fastened to the shaft 58, meshes with a worm 61 fastened to a worm shaft journalled in the frame 47, and a bevelled gear fastened on this worm shaft meshes with a bevelled gear 63 turned by a hand wheel 64 for tilting the tumbling barrel to any desired position. The worm shaft is suitably prevented from end play, and the lead of the worm 61 is such that the worm will not be turned by the worm wheel 60.

To provide for rotation of the tumbling barrel irrespective of the tilted position of this barrel, a ring gear 65, secured to the annular flange 48, is rotatably driven by a pinion 66 fastened on a shaft 67 which is journalled coaxially of the sleeve extension 57 in the boss 55 and in an arm 68 of the frame 46. Rotation is imparted to the driving pinion 66 by a reversible motor 70 belt connected to a pulley 71 that is fastened on the shaft 67.

In the operation of my invention, the uncovered tumbling barrel 10 is initially tilted to the loading position A by the hand wheel 64, and work pieces W in sufficient numbers for a tumbling operation are placed in the tumbling chamber 12. If desired, water or various solutions may also be placed in the barrel to aid in cleaning the work pieces and to wash out the dirt and scale from the barrel when the barrel is emptied. The cover 23 is clamped in sealing position by the hand wheel 24, and the hand wheel 64 is operated to position the barrel horizontally. The reversible motor 70 is now operated to rotate the barrel in the direction shown in Figure 5 which causes the tumbling balls 16, previously pocketed in the various compartments of the C-shaped chamber 14, to roll in through the passages 18 into the tumbling chamber 12 where they will remain in tumbling relation with the work pieces as long as the barrel rotation continues in this direction. After the tumbling operation, the motor 70 is reversed to rotate the barrel through a sufficient number of turns and in an opposite direction as shown in Figure 6 so that the tumbling balls 16 will separate from the work pieces and be directed by the shoulder 34 into the passages 18 through which they will roll into the chambers 14 where they will remain pocketed until the next tumbling rotation of the barrel. The cover 23 is next removed and the hand wheel 64 is operated to tilt the barrel to the discharge position B whereupon the work pieces W will be emptied from the barrel while the tumbling balls 16 remain pocketed in the chambers 14. The cross partitions or baffles 36 limit the longitudinal shifting of the tumbling elements 16 so that they do not gravitate to the lower end of the barrel and force some of them back into the inner chamber. Also when the barrel is again horizontal, the elements 16 are held distributed along the length of the barrel for efficient distribution into the inner chamber in a series of streams.

I claim:

1. A rotatable tumbling barrel for tumbling work pieces together with tumbling elements smaller than the work pieces and comprising a pair of inner and outer hollow members spaced to provide therebetween an arcuate tumbling element chamber peripherally extending more than half of the peripheral distance around said inner member, the inner member providing a tumbling chamber for both work pieces and tumbling elements, mechanism supporting said barrel for rotation about an axis extending longitudinally through said inner member, and means providing between said chambers and located at one peripheral end of the arcuate chamber a passage

which will pass only the tumbling elements between said chambers.

2. A mechanism for tumbling work pieces together with tumbling elements smaller than the work pieces and comprising a barrel having a hollow outer member entirely surrounding and spaced from an inner hollow member for the greater portion of its periphery to provide an outer chamber and an inner chamber within said outer chamber, means engaging the periphery of the barrel for supporting the barrel for rotation about an axis extending through the barrel, and means providing a tumbling element passage extending between the chambers and located at one peripheral end of the outer chamber, said passage being too small to pass the work pieces but large enough to pass the tumbling elements into one chamber in one direction of rotation and to return them to the other chamber in the opposite direction of rotation.

3. A rotatable tumbling barrel for tumbling work pieces together with tumbling elements smaller than the work pieces and comprising a rotatably mounted hollow outer member, a shell completely within and supported by the outer member, said shell containing a tumbling chamber for both the work pieces and the tumbling elements, a portion of the shell being spaced from the outer member to provide an arcuate tumbling element chamber extending about said shell, and means providing between said chambers a passage which will admit the tumbling elements and which will not admit the work pieces, the passage being located at one peripheral end of the arcuate chamber.

4. In a rotatable barrel for tumbling work pieces mixed with tumbling elements of another size, an inner shell forming an inner chamber, a substantially circular outer wall surrounding the inner shell and co-operating therewith to form an outer chamber extending more than half way but less than the whole peripheral distance round the inner shell, one of the chambers constituting a tumbling chamber when the barrel is rotated in one direction and the other chamber constituting a separating chamber when the barrel is rotated in the opposite direction, and the inner shell having a passage communicating with the outer chamber and of a size between that of the work pieces and the tumbling elements, the passage being located at one peripheral end of the outer chamber.

5. In a rotatable barrel for tumbling work pieces mixed with tumbling elements of another size, an inner shell forming an inner chamber, a substantially circular outer wall surrounding the inner shell and co-operating therewith to form an outer chamber extending more than half way but less than the whole peripheral distance round the inner shell, the inner shell having a passage communicating with one peripheral end only of the outer chamber and of a size between that of the work pieces and the tumbling elements, and supporting means engaging the outer wall to support the barrel for rotation.

6. In a rotatable barrel for tumbling work pieces mixed with tumbling elements of another size, an inner shell forming an inner chamber, a substantially circular outer wall surrounding the inner shell and co-operating therewith to form an outer chamber, the inner shell having a series of passages distributed along its length and communicating with the outer chamber, each passage being of a size between that of the work pieces and the tumbling elements, means to support the barrel for tilting movement, and the outer chamber having partitions or baffles to divide it into a series of cross compartments to limit longitudinal movement of articles contained therein when the barrel is tilted.

7. Tumbling mechanism comprising a barrel rotatable in opposite directions and having a chamber to tumble work pieces mixed with tumbling elements of another size, the barrel having a second chamber communicating with the first chamber by a passage of a size between that of the work pieces and the tumbling elements, and one of the chambers being outside of the other and extending from the passage around more than half of the circumference of the inner chamber but less than the whole circumference, one chamber receiving the tumbling elements alone from the passage in one direction of rotation and discharging them through the same passage into the other chamber in the opposite direction of rotation.

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