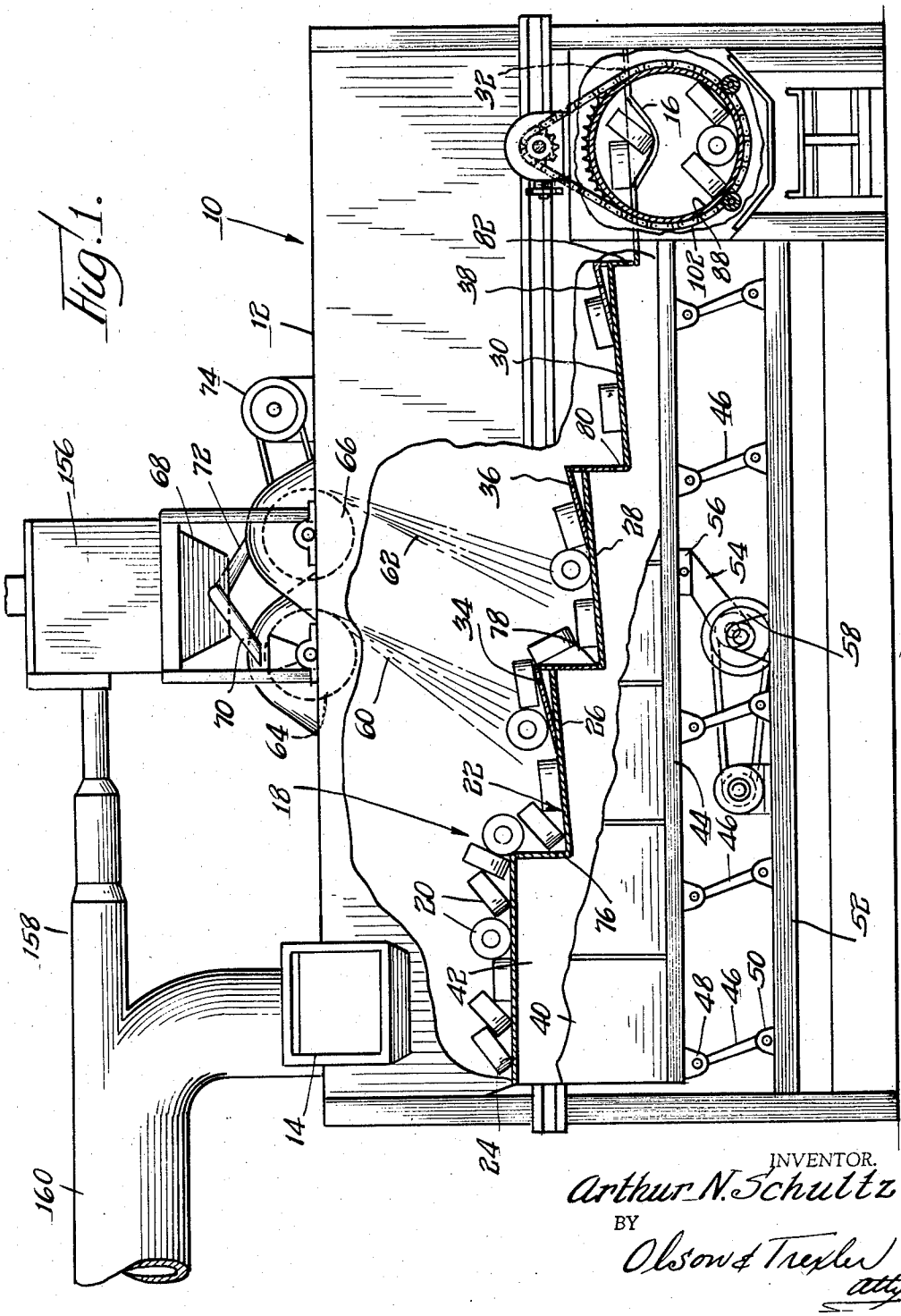
May 26, 1959 A. N. SCHULTZ 2,887,826

SHOT BLAST MACHINE

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Fig. 1.



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Fig. 2.

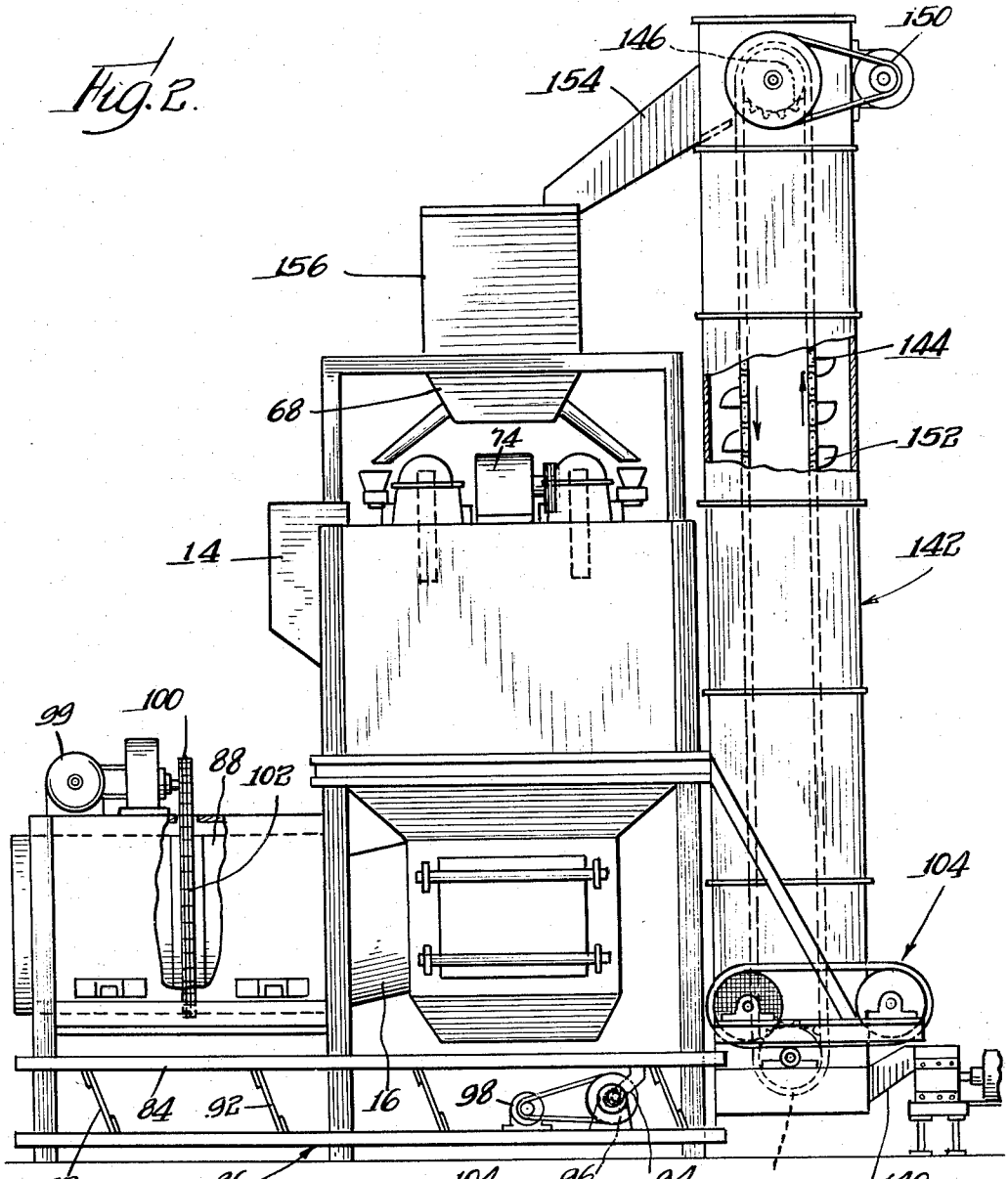
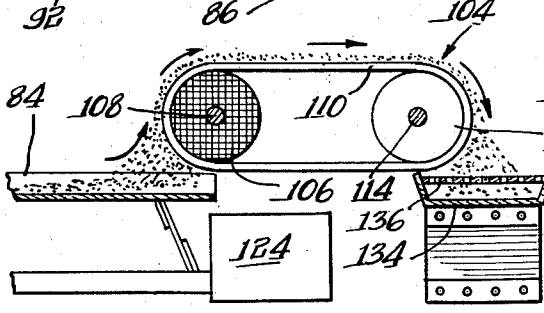


Fig. 3



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Fig. 4.

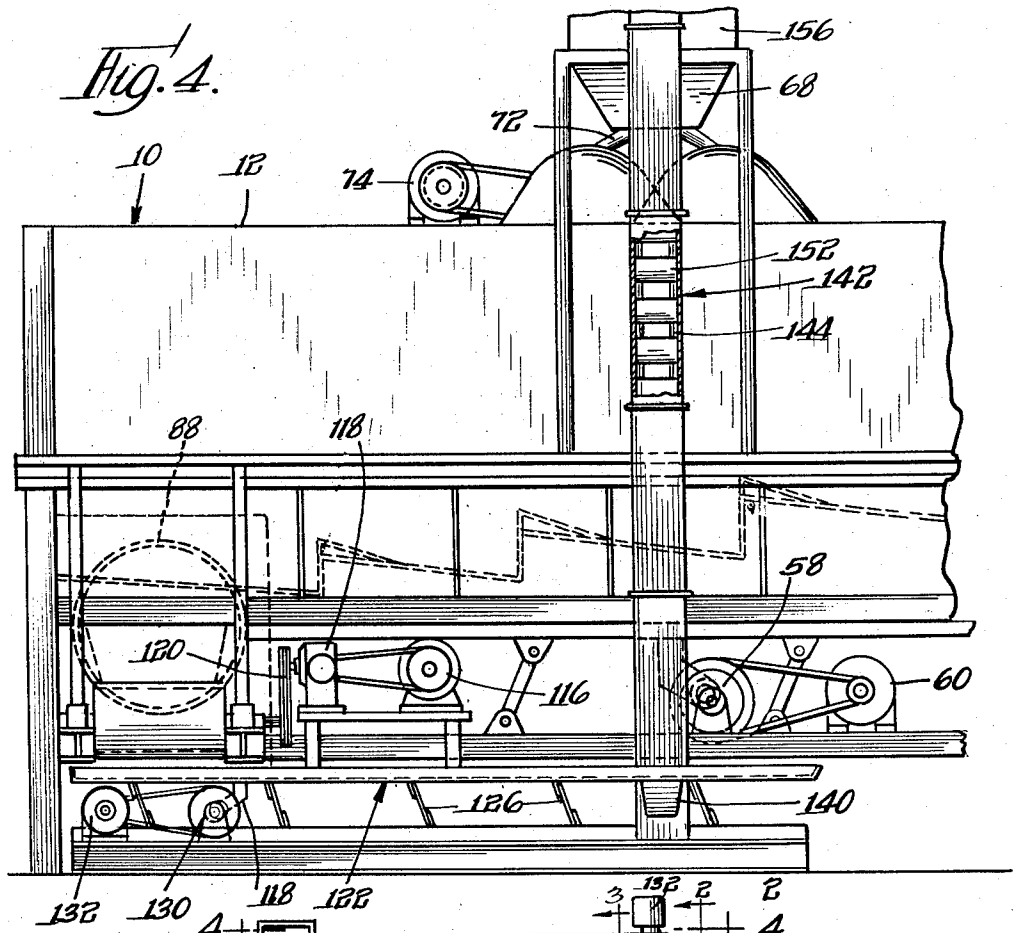
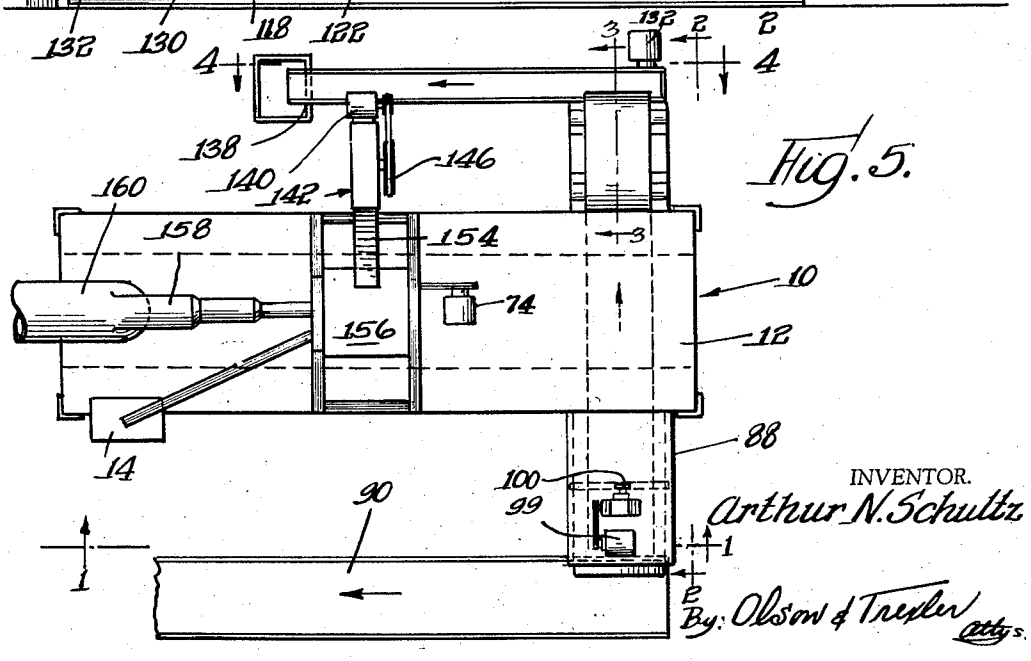


Fig. 5.



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SHOT BLAST MACHINE

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Application October 30, 1957, Serial No. 693,340

15 Claims. (Cl. 51—9)

The present invention relates to a novel apparatus for cleaning workpieces, such as castings and the like, and more particularly to a novel shot blast apparatus.

Heretofore proposed shot blast apparatus have usually included sprocket and chain type drive or conveyor means for advancing articles to be cleaned through a shot blast chamber, which sprocket and chain means are exposed to the shot stream so that there is a frequent need for replacement and repair with resulting high cost of maintenance and high shut down time. Furthermore, considerable difficulty has been encountered in economically and efficiently recovering the shot so that it may be re-used.

An important object of the present invention is to provide a novel shot blast apparatus comprising simplified and rugged means for conveying workpieces through a shot blast chamber which means is constructed so that trouble free operation with substantially reduced maintenance costs may be obtained.

A more specific object of the present invention is to provide a novel apparatus of the above described type which is constructed so as to promote turning or tumbling of the workpieces in a manner to expose substantially all surfaces of the workpieces to the shot stream whereby to obtain more efficient and thorough cleaning of the workpieces.

Another important object of the present invention is to provide a novel shot blast apparatus which is constructed so that the shot may be rapidly and efficiently recovered from and cleansed of said or other foreign material or scrap removed from the workpieces whereby the shot may be recirculated for further cleaning operations.

Other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings wherein:

Fig. 1 is a sectional view taken along line 1—1 in Fig. 5 and partially broken away and showing an apparatus incorporating features of the present invention;

Fig. 2 is an elevational view as seen from line 2—2 in Fig. 5;

Fig. 3 is an enlarged fragmentary sectional view taken along line 3—3 in Fig. 5;

Fig. 4 is a fragmentary side elevational view of the apparatus as seen from line 4—4 in Fig. 5; and

Fig. 5 is a plan view on a reduced scale of an apparatus incorporating features of the present invention.

Referring now more specifically to the drawings wherein like parts are designated by the same numerals throughout the various figures, an apparatus 10 incorporating features of the present invention is provided with a relatively large cleaning chamber or housing 12 having a workpiece loading door 14 in an upper portion adjacent one end thereof and an outlet chute 16 extending laterally from a lower portion adjacent the opposite end thereof as shown best in Figs. 1 and 2. In accordance with a feature of the present invention the apparatus is provided with simple and rugged conveying means 18

which forms the bottom of the cleaning chamber or housing 12 and is adapted to advance workpieces or articles 20 from the loading door 14 to the discharge chute 16.

The conveying means 18 includes a stepped structure 22 preferably formed from steel plates appropriately welded or otherwise secured together. As shown best in Fig. 1 this structure has a generally horizontal step 24 beneath the loading door 14 and a plurality of additional steps 26, 28, 30 and 32 which are inclined slightly upwardly from the preceding higher step toward the next lower step. This arrangement retards the flow of the articles from one step to the next when the structure 18 is oscillated or vibrated in the manner described below. In addition it is important to note that relatively sharply inclined dams or lips 34, 36 and 38 are provided over marginal portions of the steps 26, 28 and 30. These dams serve to cause the articles or workpieces to pile up on each of the steps and to be turned or tumbled as they advance over each step and from one step to the next so as to expose all surfaces thereof to the shot blast.

The stepped structure 18 has opposite upstanding side panels 40 and 42 which are secured to and extend upwardly from a shallow trough 44. This trough is a portion of the oscillating conveyor means and is supported for oscillating movement by a plurality of reactor legs 46 having upper ends connected to the trough by brackets 48 and lower ends connected to bearing mounts 50 which in turn are secured to a fixed base member 52. The conveyor means is adapted to be oscillated by means of an eccentric crank 54 pivotally connected to a bracket 56 secured to the trough 44 and operatively connected with a wheel 58 which is driven by motor and belt means 60 as shown in Fig. 4. It will be appreciated that the oscillating and vibrating motion of the stepped structure will cause the workpieces or articles to migrate from the higher portion of the structure and down each successive step toward the discharge chute.

Steel pellets or shot are directed toward the workpieces on the stepped structure in streams 60 and 62 from shot wheels 64 and 66 rotatably supported at the upper side of the chamber or housing 12. These shot wheels are of known construction and therefore need not be described in detail. The steel pellets or shot supply is retained in a hopper 68 supported above the wheels and flows to the wheels through conduits 70 and 72. The wheel 66 is driven by motor and belt means 74, and the wheel 64 is driven from the wheel 66 by suitable gear or belt means, not shown.

The stepped structure is provided with apertures 76, 78, 80 and 82 adjacent the lower ends of the steps 26, 28, 30 and 32 respectively. These apertures permit the used shot and a portion of the sand, scrap or other foreign material cleaned from the articles or castings to fall from the steps and onto the trough 44. The material which falls onto the trough 44 is advanced toward the right as viewed in Fig. 1 and deposited on the top or trough portion 84. Additional shot, sand and the like is separated from the workpieces in a perforated rotatable tumbling barrel 88 which is disposed to receive the articles or castings from the discharge chute 16 and to deposit the cleaned articles onto a conveyor 90. The additional material which is separated from the articles or castings falls from the tumbling barrel 88 and onto the trough 84 of the conveyor 86. The trough 84 of the oscillating conveyor 86 is supported for oscillating movement on reactor legs 92. This conveyor is operated or vibrated by means of a link 94 connected thereto and also to a wheel 96 which is driven by motor and belt means 98. The tumbling barrel is rotated by motor means 99 which drives sprocket 100 meshing with a chain 102 encircling the barrel.

In accordance with another important feature of the present invention separator means 104 is provided adja-

cent an end of the conveyor trough **84** for separating the shot from the sand and the like rapidly and efficiently. As shown in the drawings, this means includes a magnetic pulley wheel **106** mounted for rotation on a shaft **108** slightly above the discharge end of the conveyor trough **84**. This pulley wheel may be an electromagnet or, if desired, it may be provided with an annular series of permanent magnets. An endless belt **110** of non-magnetic material encircles the pulley wheel **106** and a non-magnetic pulley **112** rotatably supported by shaft **114**. As shown in Fig. 4 motor means **116** is provided for driving the shaft **114** and thus the rollers and the belt through speed reducer **118** and belt and pulley means **120**. The belt **110** and the associated pulleys are driven in the direction of the arrows shown in Fig. 3 so that the pellets and any other magnetic material are lifted from the conveyor trough **84** and magnetically held against the belt **110** by the pulley **106**. As the belt travels over the upper side of the pulley **106** the magnetic pellets and material are separated from the effective magnetic field of the pulley so that they readily fall onto a conveyor **122** as the belt passes downwardly and around the pulley **112**. Any sand or other non-magnetic material on the conveyor **84** is discharged from the end of the conveyor and into any suitable receptacle **124**.

The conveyor **122** is similar to the above described oscillating conveyors and is supported on a plurality of reactor arms **126**. Suitable drive means is provided for oscillating the conveyor **122**, which drive means comprises a crank arm **128** connected between the conveyor and a wheel **130** which is driven by motor and belt means **132**.

The conveyor **122** has an imperforate bottom **134** disposed beneath an elongated perforated member **136** as shown in Figs. 3 and 4. All of the material discharged from the belt **110** falls onto the perforated member **136** which has holes therethrough of a size sufficient to permit the pellets or shot to drop onto the bottom **134**. Scrap and the like is retained on the perforated member **136** for advancement toward and discharge into a suitable receptacle **138** located at an end of the conveyor. The shot which has been separated from the scrap and any other foreign material by falling onto the bottom **134** is discharged laterally from the conveyor and into a hopper **140** at the base of an elevator mechanism **142**. The elevator mechanism **142** comprises an endless belt **144** encircling upper and lower pulleys **146** and **148**. The upper pulley **146** is driven by motor and belt means **150**. Buckets **152** are spaced along the belt **144** for picking up shot from the hopper at the lower end of the elevator and discharging the shot into a chute **154** at the upper end of the elevator. The shot falls from the chute **154** into a vacuum type separator **156** and then into the supply hopper **68**. The separator **156** has an outlet connected with a duct **158**. The duct **158** merges with a larger duct **160** which communicates with the upper side of the chamber or housing **12** and which is also connected with a fan or source of vacuum, not shown. The separator **156** is of known construction and therefore need not be described in detail and is effective for removing any small dust particles and the like which may cling to the shot when the shot is separated from the sand by the magnetic separator means described above. The shot which is returned to the hopper **68** is delivered to the shot wheel and thus begins another cycle through the apparatus.

While the preferred embodiment of the present invention has been shown and described herein, it is obvious that many structural details may be changed without departing from the spirit and scope of the appended claims.

The invention is claimed as follows:

1. A shot blast apparatus for processing workpieces comprising housing means, means mounted for providing a stream of shot in said housing means, a stepped structure in said housing means and over which workpieces may be advanced for exposure to the stream of shot, means for oscillating said stepped structure for causing the workpieces to be advanced thereon and for exposure to the stream of shot.

2. A shot blast apparatus for processing workpieces such as casting and the like, comprising housing means, means mounted for providing a stream of shot in said housing means, a generally horizontally disposed stepped structure having a plurality of steps in said housing means and over which workpieces may be advanced for exposure to the stream of shot, means for oscillating said stepped structure for causing workpieces to advance along the stepped structure from one step to the next, and means on said steps for retarding advancement of workpieces for causing tumbling of the workpeices so as to expose different surfaces of each workpiece to the stream of shot.

3. A shot blast apparatus, as defined in claim 2, wherein said retarding means includes an inclined abutment on certain of said steps of the stepped structure.

4. A shot blast apparatus, as defined in claim 2, which includes aperture means in said stepped structure through which expended shot may fall for separation from workpieces on the stepped structure, and means beneath the stepped structure for receiving and conveying the expended shot to a desired point of discharge.

5. An apparatus, as defined in claim 4, which includes a perforated tumbling barrel rotatably supported adjacent a discharge end of said stepped structure, means for directing workpieces from said discharge end of the stepped structure and into said tumbling barrel, and means for rotating said tumbling barrel for further separating shot and any other foreign material from the workpieces.

6. An apparatus, as defined in claim 5, which includes means for receiving shot and foreign material from said tumbling barrel and from said first mentioned receiving and conveying means, and magnetic means disposed adjacent said last mentioned receiving means for separating the shot from other foreign material on said last mentioned receiving means.

7. A shot blast apparatus for processing workpieces such as castings for removing sand, scrap and the like from the workpieces, comprising housing means, means mounted for providing a stream of shot in said housing means, conveying means including a stepped structure in said housing means over which workpieces may be advanced for exposure to the stream of shot, a second conveying means disposed for receiving expended shot, sand and the like from said first conveying means, a tumbling barrel disposed adjacent said first and second conveying means for receiving workpieces from said first conveying means and accomplishing separation of shot, sand and the like from such workpieces and directing such shot, sand and the like onto said second conveying means, magnetic separator means disposed adjacent said second conveying means for separating shot and any magnetizable scrap and the like from the sand on said second conveying means, and a third conveying means disposed for receiving the shot and scrap from said magnetic separator means, said third conveying means including a perforated member onto which the shot and scrap are deposited from said magnetic separator means, said perforated member permitting the shot to pass therethrough for separating the shot from the scrap.

8. A shot blast apparatus, as defined in claim 7, which includes means for transferring the shot from said third conveying means back to said means for providing a stream of shot in the housing means, said transferring means including air vacuum separator means for removing dust from the shot.

9. A shot blast apparatus, for processing workpieces such as castings and the like comprising a stepped structure over which workpieces may be advanced for exposure to a stream of shot, means disposed adjacent said stepped structure for directing a stream of shot over said stepped

structure and against the workpieces on the stepped structure, means for oscillating said stepped structure for causing workpieces to be advanced along the stepped structure, means disposed adjacent said stepped structure for collecting expended shot and material removed from the workpieces, and magnetic means disposed adjacent said collecting means for removing the shot from the collecting means and thereby separating the shot from other material on the collecting means.

10. An apparatus, as defined in claim 9, which includes conveying means disposed for receiving shot and any other magnetic material from the magnetic separator means, said conveying means including an upper perforated member under which the shot and said material are initially deposited and through which the shot may pass for separation from said material.

11. An apparatus, as defined in claim 9, which includes means for receiving the shot from said magnetic separator means and directing the shot for re-use in the apparatus, said last mentioned means including vacuum separator means for removing dust and the like from the shot.

12. An apparatus, as defined in claim 10, which includes means for directing the shot from said conveying means for re-use in the apparatus, said last named means including a vacuum separator for removing dust from the shot.

13. In a shot blast apparatus for removing sand and the like from workpieces such as castings, the combination comprising means for delivering a stream of shot

for treating the workpieces, means for collecting expended shot and sand and the like from the workpieces, magnetic means disposed above said collecting means for removing the shot from the sand, and means for receiving the shot from the magnetic means and conveying the shot for re-use in the apparatus.

14. An apparatus, as defined in claim 13, wherein said last mentioned means includes vacuum separator means for removing dust from the shot.

15. In a shot blast apparatus for removing sand and the like from workpieces such as castings, the combination comprising means for delivering a stream of shot for treating the workpieces, means for collecting expended shot and sand and the like from workpieces, a magnetic roller rotatably disposed above said collecting means for removing the shot from the sand and the like on the collecting means, and conveying means including an endless belt of non-magnetizable material encircling said magnetic roller for removing the shot from the magnetic roller and conveying the shot to a desired point of discharge.

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