Jan. 27, 1970 J. ALONSO 3,491,563

CENTRIFUGAL SHOT PEENING DEVICE

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Fig. 1.

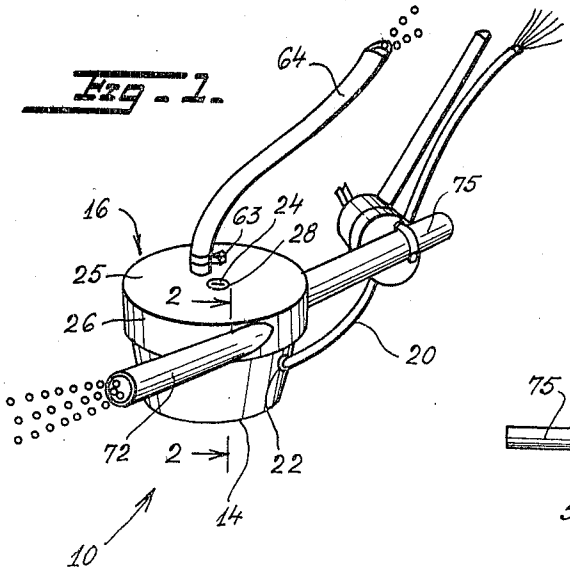


Fig. 3.

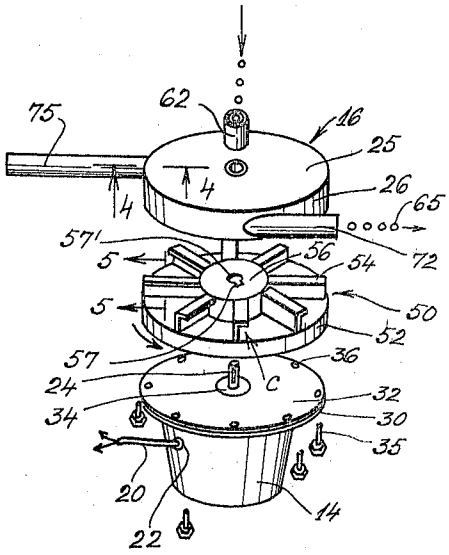
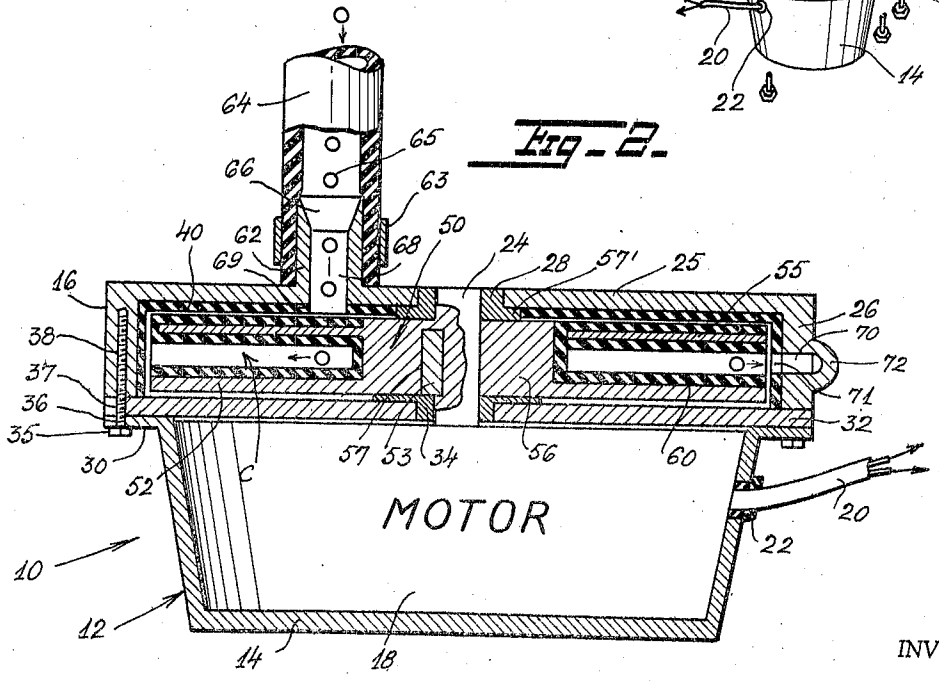


Fig. 2.



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Fig 4.

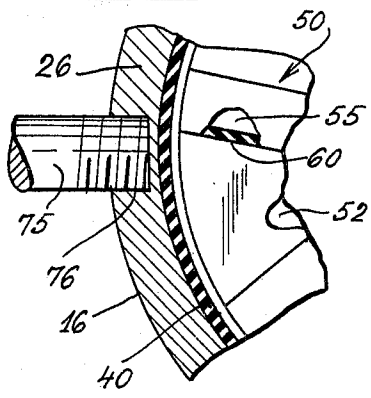


Fig 5.

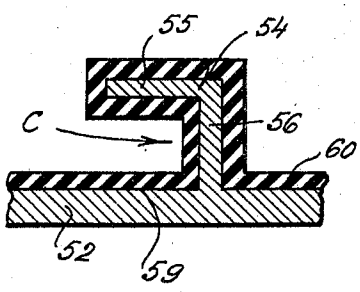
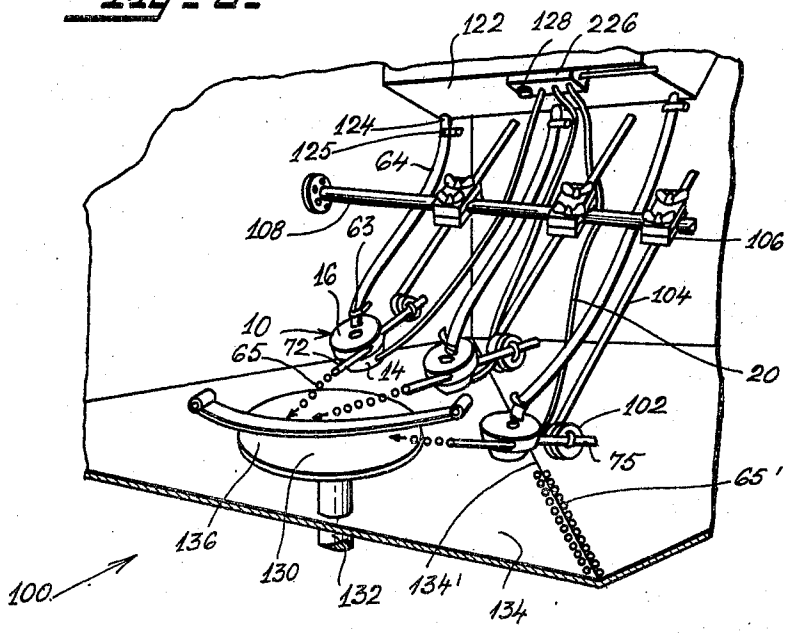


Fig 6.



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Fig. 7.

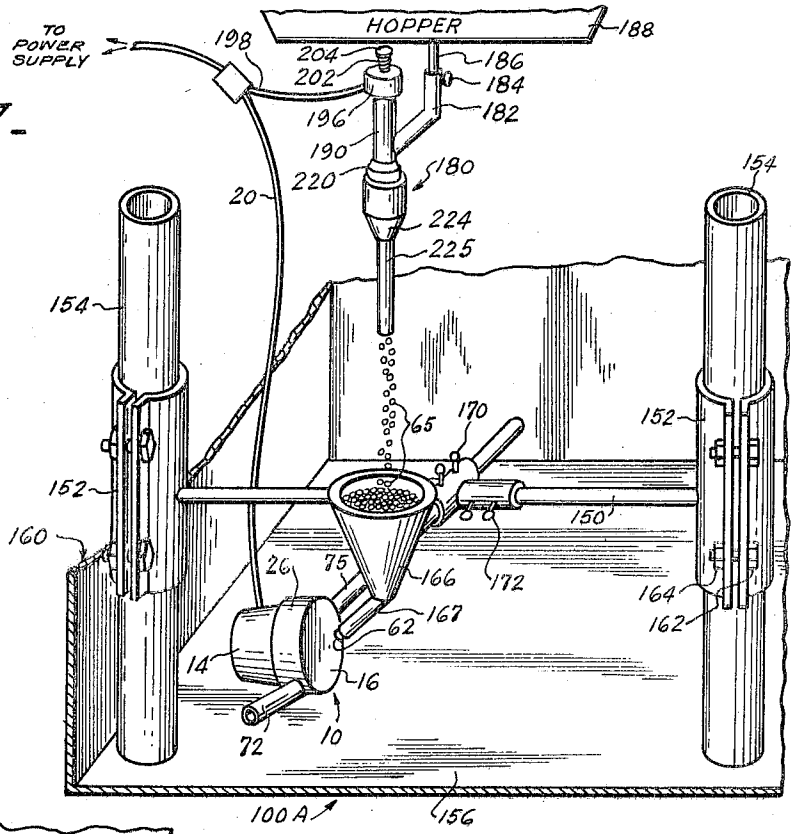


Fig. 8.

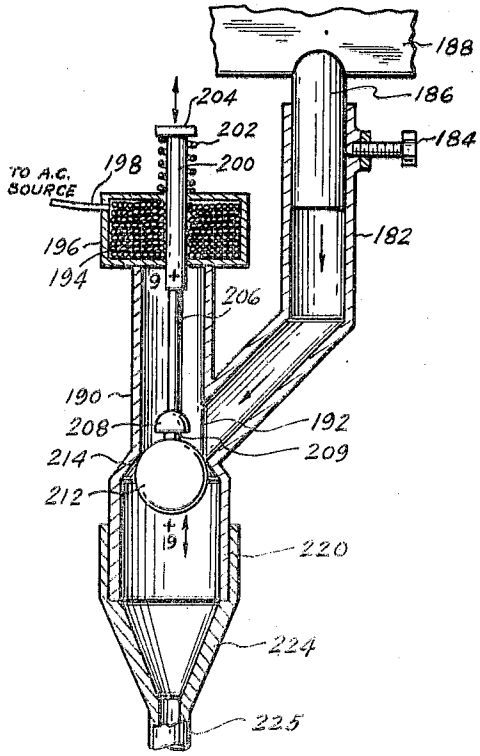
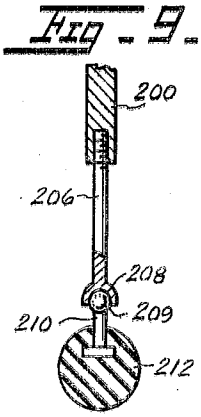


Fig. 9.



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United States Patent Office 3,491,563 Patented Jan. 27, 1970

3,491,563

CENTRIFUGAL SHOT PEENING DEVICE

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Int. Cl. B21j 13/00
U.S. Cl. 72—53 10 Claims

ABSTRACT OF THE DISCLOSURE

The disclosure describes a device containing an impeller driven by a motor. Shot balls or beads are fed into the device near the center of the impeller. The shot balls are accelerated centrifugally and are tangentially discharged from the device to impinge on a piece of work being peened.

The invention concerns an improved shot peening device in which shot balls or beads are accelerated centrifugally by an impeller in the device.

Heretofore it has been conventional to discharge shot used for peening purposes from nozzles under air pressure. Systems such as described in U.S. Patents 2,933,802 and 2,982,007 employ air actuated shot peening devices. For successful operation such prior systems require air compressors, air hoses and other paraphernalia which are awkward to handle, difficult to control, expensive to install, and costly to operate. The present invention avoids these objections by providing a shot peening device which has a self-contained motor driving an impeller for imparting high controllable speeds to shot fed into the device.

One object of the invention is to provide a shot peening device having a motor driven impeller in a casing arranged to receive shot from a hopper and to discharge the shot at high speed tangentially from the casing.

A further object is to provide a shot peening device as described wherein the casing is lined with resilient, self-lubricating shock resistant material to reduce impact and wear inside the case and wherein the impeller will be made of any metal such as aluminum or carbide steel.

For further comprehension of the invention and of the objects and advantages thereof, reference will be had to the following description and accompanying drawings and to the appended claims in which the various novel features of the invention are more particularly set forth.

In the accompanying drawings forming a material part of this disclosure:

FIGURE 1 is a perspective view of a shot peening device embodying the invention.

FIG. 2 is an enlarged vertical sectional view taken on line 2—2 of FIG. 1.

FIG. 3 is an exploded perspective view of parts of the device.

FIG. 4 and FIG. 5 are enlarged fragmentary sectional views taken on lines 4—4 of FIG. 3 and 5—5 of FIG. 3, respectively.

FIG. 6 is a reduced perspective view of an array of equipment employing shot peening devices according to the invention.

FIG. 7 is a fragmentary perspective view of another array of equipment employing the invention.

FIG. 8 is a vertical sectional view of a vibratory shot feeder employed in the array of FIG. 7.

FIG. 9 is a fragmentary sectional view taken on line 9—9 of FIG. 8.

Referring first to FIGS. 1–5, there is shown device **10** having a casing **12** including a tapered dished base **14** and cylindrical cover **16**. In the base is an electric motor **18** energized via an electric cable **20** passing through a grommet **22** at one side of the base. The motor has a central drive shaft **24** extending axially of cover **16**. The cover has a circular top **25** and cylindrical wall **26**. In top **25** is a centrally located bearing **28** which permits the outer end of shaft to rotate.

Interposed between radial annular flange **30** at the open top of the base and the bottom edge of wall **26** is a circular spacer plate **32**. This plate is fitted with a central bearing **34** through which shaft **24** extends. Bolts **35** extend through holes **36, 37** in flange **30** and plate **32**. The bolts are seated in threaded holes **38** in cylindrical wall **26** of the cover. The inner side of the top **25** of the cover and the inner side of wall **26** is lined with a tough, resilient liner **40**. This liner is preferably made of a synthetic, self-lubricating elastomer such as polytetrafluorethylene or the like.

Rotatably disposed inside the cover above plate **32** is an impeller **50**. The impeller has a circular base plate **52**. Integral with this plate is a plurality of L-shaped angle bars **54**. The bars extend radially from a central hub **56** extending axially from and integral with base plate **52**. The hub **56** has a slot **57** and bore **57'** which receive key **53** and shaft **24** so that the shaft turns the impeller. Radial channels C are defined between overchanging walls **55** and axially extending radial walls **56** of bars **54**, and the base plate **52**, see FIG. 5. All the channels are open at one side and at outer ends of the angle bars. The walls **55, 56** of the angle bars and the upper side **59** of plate **52** are all coated with a resilient liner **60**. The liner is made of tough, self-lubricating material like liner **40**. Thus all channels are covered by liner **60**.

Near its center, on top **25** of the cover is a nipple **62**. Attached to this nipple by clamp **63** is a flexible pipe **64**. Balls of shot **65** are fed through this pipe and into the tapered end **66** of bore **68** in the nipple. The nipple is integral with top **25** of the cover. Hole **69** in liner **40** registers with bore **68** so that the shot **65** falls into the impeller **50** between the lined angle bars and on to plate **52**. An opening **70** is provided in one side of wall **26** of the cover. This opening registers with opening **71** in liner **40** and is coplanar with channels C. Integral with wall **25** is a tangentially extending nozzle **72** starting from opening **70** and providing communication between the interior of the cover and the exterior of the casing. A support bar **75** can be screwed into threaded bore **76** in wall **26** to extend radially therefrom, see FIG. 4.

FIG. 6 shows one example of a shot peening system **100** in which a plurality of shot peening devices **10** constructed as described in connection with FIGS. 1–5 above are provided. The devices **10** are supported by universal clamps **102** connecting bars **75** to extension bars **104** adjustably secured by clamps **106** to horizontal bar **108**. Bar **108** is supported by walls **110** of a hook **120** in which the assembly is installed. A hopper **122** is supported above devices **10**. It contains the shot **65** discharged from the several devices. This hopper has outlets **124** to which a plurality of flexible pipes **64** are connected by clamps **125**. The electric cords or cables **20** of the several devices **10** are connected to an electric power supply box **126**. A control **128** on this box can be adjusted to regulate the current or voltage applied to the motors in the several devices for setting the speed of the motors.

A turntable **130** is supported on a rotatable shaft **132** extending through inclined floor **134** of the hood. A workpiece **136**, in this instance a bowed spring of a vehicle, is mounted on the turntable and rotates with it. When the motors of the shot peening devices **10** are turned on and shot **65** is released from the hopper, the shot is discharged at very high velocity from the nozzles **72** all aimed at the workpiece **136**. As the workpiece turns it is smoothly hardened and smoothly polished by the impinging shot. The walls of the hood retain the discharge shot for reloading in the hopper and reuse. The discharged shot **65'** collects in trough **134'** of the floor **134**.

It will be noted that the resilient liners **40**, **60** of the casing and the impeller prevent wear of the metal parts of the device **10**. Furthermore, the smooth self-lubricating lining of channels C permit the shot **65** to roll frictionlessly radially of the impeller and circumferentially of the cover to be discharged at very high velocity from the nozzle **72**. The resilient liners also reduce operating noise considerably since they absorb the impact of shot striking the wall **26** and parts of the impeller as the shot drops into the casing and on the rotating impeller.

The metal parts of the casing can be made of lightweight aluminum. Thus the device **10** will have minimum weight and can easily be handled and supported. By making the metal parts of cast aluminum the device can be manufactured very economically. The device can be made up in various sizes with different size motors for different applications.

In FIG. 7 is shown an array of equipment **100A** in which shot peening device **10** is supported in an axially horizontal position by a horizontal bar **150** carried by flanged clamp plates **152** supported on spaced vertical posts **154** on floor **156** of hood **160**. Bolts **162** and nuts **164** on the clamp plates adjustably position bar **150** on the posts. An axially vertical funnel **166** has a bottom discharge nozzle **167** connected to nipple **62** through which shot **65** is fed to the device **10**. Support bar **75** is secured by cross fitting **168** to bar **150**. Screws **170**, **172** in the fitting secure bar **75** in fitting **168** and secure the fitting on bar **150**.

Shot **165** is dropped freely into the funnel from a vibratory gate or valve **180**. The gate **180** has a tubular arm **182** secured by bolt **184** axially vertical discharge nozzle **186** of hopper **188** which contains the balls of shot **165**; see FIG. 8. Arm **182** communicates with cylindrical housing **190** of the gate via a lateral opening **192**. At the upper end of the housing is a solenoid **194** contained in a casing **196** on top of the housing. The solenoid is connected via cable **198** in parallel with cable **20** to a remote alternating current electrical power supply. Thus when the motor of the device **10** is running the solenoid is energized. The solenoid has a reciprocatable vertical magnetic plunger **200**. A coil spring **202** is mounted on the plunger and is engaged between cap **204** of the plunger and the top of the casing **196**.

Secured to plunger **200** is a vertical rod **206** which terminates in a universal ball joint **208** engaged with ball **209** formed on top of a short rod **210**; see FIG. 9. Rod **210** is secured in the body of a resilient rubber or plastic ball **212**. The ball **212** is located in and normally closes tapered throat **214** of housing **190**. The ball **212** is supported in a self-aligning position in throat **214** by joint **208**, **209** and by rods **206**, **210**, plunger **200** and spring **202**. Normally arm **182** if filled with shot **165** which covers the top of ball **212** at throat **214**. When the solenoid is energized by alternating current, the plunger and ball reciprocate vertically while the shot is fed past the ball **212** at throat **214** in the cylindrical bottom section **220** of the housing. A funnel **224** is secured to the bottom of the bottom section **220**. Nozzle **225** of funnel **224** is vertical and disposed above funnel **166**. Thus the shot **165** drips gravitationally into the funnel **166** to keep it filled and thus supplies the device **10** with shot while both the solenoid **194** and motor of the device **10** are running.

While I have illustrated and described the preferred embodiments of my invention, it is to be understood that I do not limit myself to the precise construction herein disclosed and that various changes and modifications may be made within the scope of the invention as defined in the appended claims.

What is claimed is:

1. A shot peening device, comprising a hollow casing having a base and cover, means detachably connecting the base and cover together, an electric motor in the base, said cover having a circular top and cylindrical side wall, said motor having a drive shaft extending axially of the cover, a rotary impeller disposed in the cover, said impeller having a circular base plate with central hub keyed to said shaft so that the impeller is rotated by the shaft when the motor is running, said impeller having a plurality of angle bars integrally formed therewith and extending radially of the hub on the base plate, said angle bars defining radially extending channels open at one side and at outer ends thereof for guiding balls of shot therealong, said cylindrical wall having a lateral opening, a nozzle integral with said cylindrical wall and extending from said opening tangentially of the said cylindrical wall to provide communication between the interior of the casing and the exterior thereof for discharging balls of shot from the casing, and a nipple integrally formed with the top of the cover and opening near the center thereof into the casing at a point between the hub and the periphery of the base plate of the impeller, whereby balls of shot passing gravitationally into the casing through said nipple are guided along said channels under centrifugal force of the rotating impeller to be discharged at high speed from said nozzle.

2. A shot peening device as recited in claim **1**, further comprising resilient linings covering interior walls of the casing exposed to the balls of shot passing through the casing, said linings serving to absorb impacts of the balls of shot to prevent wear thereof and to reduce operating noise.

3. A shot peening device as recited in claim **2**, wherein said linings are made of self-lubricating material to minimize friction and maximize speed of movement of the balls of shot along said channels and around the inside of the cover.

4. A shot peening device as recited in claim **1**, further comprising a bearing plate interposed between the base and cover, said bearing plate having bearing means receiving said shaft and supporting said impeller in the casing.

5. A shot peening device as recited in claim **4**, further comprising a support bar extending radially from the casing.

6. A shot peening device as recited in claim **1**, wherein said cover has a threaded external radial bore in said cylindrical wall, and a support bar detachably threaded in said radial bore and extending radially of the casing.

7. A shot peening device as recited in claim **3**, further comprising a bearing plate interposed between the base and cover, said bearing plate having bearing means receiving said shaft and supporting said impeller in the casing.

8. A shot peening device as recited in claim **6**, wherein said threaded external radial bore in said cylindrical wall is in said cover.

9. A shot peening device as recited in claim **8**, wherein said casing is made of metal and the impeller of the most resistent carbide material or steel with resilient lining covering.

10. A shot peening device as recited in claim **8**, wherein the casing is disposed in an axially horizontal position; an axially vertical funnel connected to said nipple for feeding shot into the casing; a hopper containing said shot disposed above said funnel; and a solenoid operated

gate valve supported by the hopper above the funnel and arranged to discharge the shot from the hopper into the funnel when the motor is running to keep the funnel filled with shot which flows gravitationally into the casing through the nipple.

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