May 14, 1968 J. H. CARGILE 3,383,020

AUTOMATIC POWDER SCOOPER

Filed Aug. 29, 1966 2 Sheets-Sheet 1

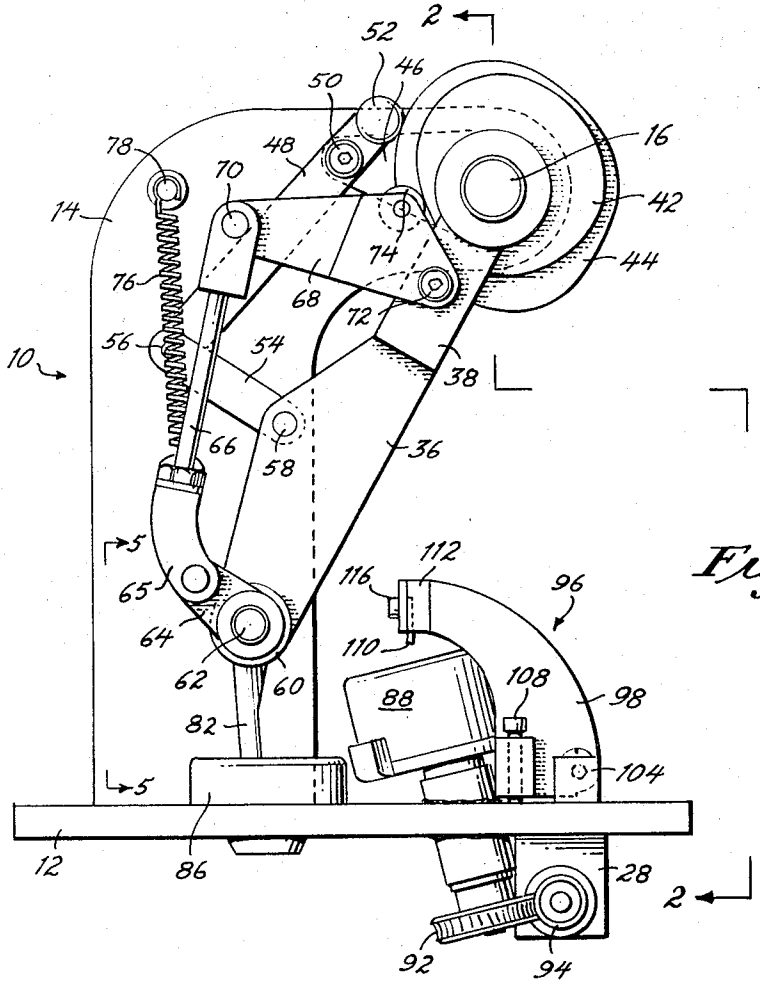


Fig. 1.

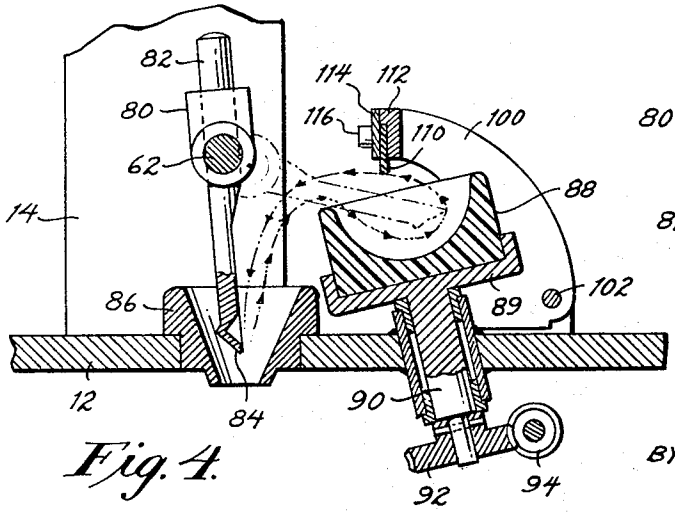


Fig. 4.

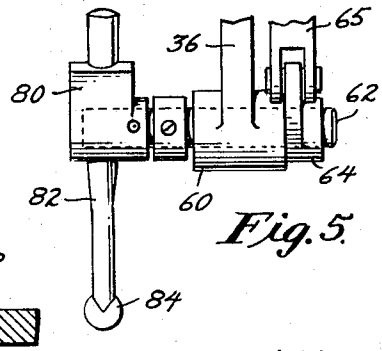


Fig. 5.

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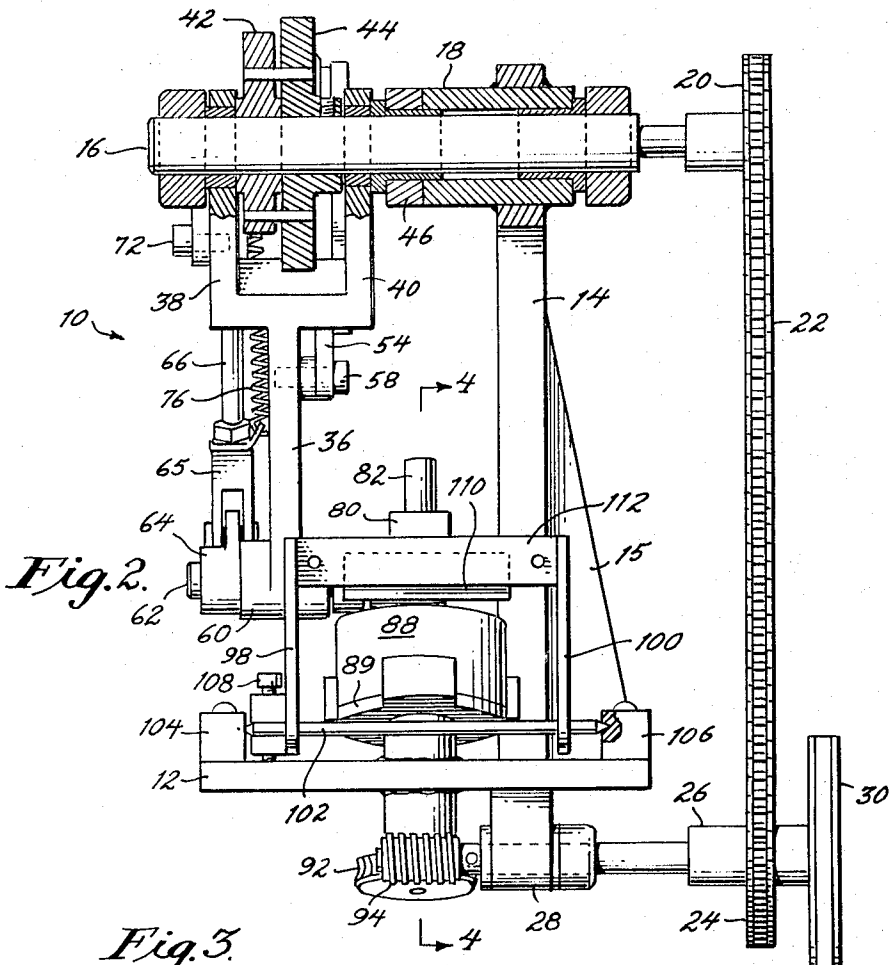


Fig. 2.

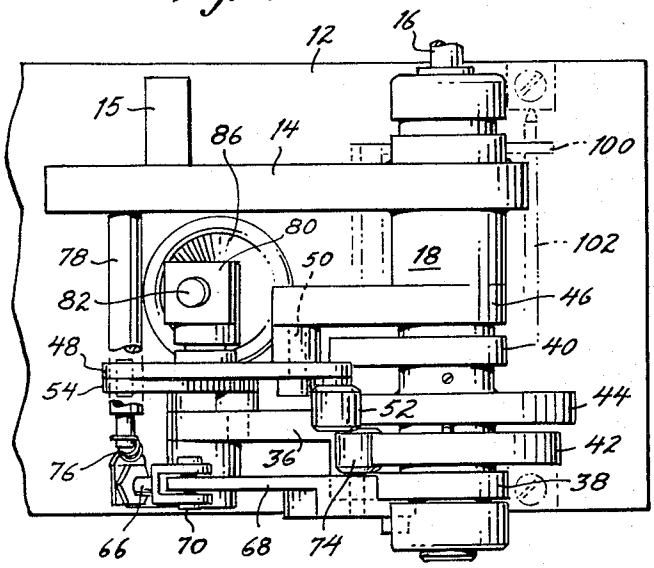


Fig. 3.

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United States Patent Office 3,383,020 Patented May 14, 1968

3,383,020

AUTOMATIC POWDER SCOOPER

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Filed Aug. 29, 1966, Ser. No. 575,637
12 Claims. (Cl. 222—168)

ABSTRACT OF THE DISCLOSURE

An automatic powder scooper which is relatively simple, inexpensive and reliable. The scooper may be used for scooping initiating explosives. Tests run with the scooper indicate constant repeatability of the charge. The scooper is small in size and can be adapted to existing loading equipment. The scooper includes an open top powder receptacle having a scoop supported adjacent thereto. The scoop is moved toward and away from the receptacle so that it may remove powder therefrom. The scoop is supported about a substantially horizontal axis so that the scoop may discharge the powder withdrawn from the receptacle. A rake-off bar is provided adjacent the receptacle for cooperation with the scoop for controlling the amount of powder therein.

This invention relates to an automatic powder scooper, and more particularly, to a mechanical device for automatically repetitively removing a controlled amount of powder from a receptacle and discharging the same into a desired area.

The need for an automatic powder scooper has existed for more than twenty years, particularly subsequent to World War II for use in connection with initiating explosives. The sensitivity of explosive powders creates special problems due to the hazards of initiation caused by friction, heat, static charges, resistance to flow, and probably other unknown factors.

Heretofore, sensitive powders have always been hand-scooped using specially designed scoops to meet a required weight charge. Use of such scoops has not been particularly satisfactory due to deviations of the weight charge resulting from the combination of a variety of factors including the human element, consistent particle size, etc.

In accordance with the present invention, there is provided an automatic powder scooper which is relatively simple, inexpensive and reliable. Thus, tests run in connection with the scooper of the present invention indicate constant repeatability of the charge. The scooper of the present invention is small in size and can be adapted to existing loading equipment. The use of an automatic powder scooper in accordance with the present invention not only eliminates the necessity for workers, provides more uniform reliability or repeatability of the charge, but also relieves workers of a task which can result in loss of life when explosions occur.

In general, the scooper of the present invention includes an open top powder receptacle having a scoop supported adjacent thereto. Means are connected to the scoop for actuating the scoop so that it moves toward and away from the receptacle so that it may remove powder from the receptacle. Said means also pivotably supports the scoop about a substantially horizontal axis so that the scoop may discharge the powder withdrawn from the receptacle. A rake-off bar is provided adjacent the receptacle for cooperation with the scoop for controlling the amount of powder on the scoop.

It is an object of the present invention to provide a novel automatic powder scooper.

It is another object of the present invention to provide an automatic device for repetitively removing powder from a receptacle and discharging the same in uniform controlled amounts.

It is another object of the present invention to provide an automatic powder scooper which is small in size, simple, and capable of being utilized on existing loading machines.

Other objects will appear hereinafter.

For the purpose of illustrating the invention, there is shown in the drawings a form which is presently preferred; it being understood, however, that this invention is not limited to the precise arrangements and instrumentalities shown.

FIGURE 1 is a side elevation view of the scooper of the present invention.

FIGURE 2 is of a sectional view taken along the line 2—2 in FIGURE 1.

FIGURE 3 is a top plan view of the scooper in FIGURES 1 and 2.

FIGURE 4 is a sectional view taken along the line 4—4 in FIGURE 2.

FIGURE 5 is a sectional view taken along the line 5—5 in FIGURE 1.

Referring to the drawing in detail, wherein like numerals indicate like elements, there is shown in FIGURE 1 an automatic powder scooper designated generally as **10**.

The scooper **10** includes a horizontal base **12** having an upright support member **14** and brace **15**. The upper end of the support member **14** is provided with a generally horizontally disposed sleeve **18** supporting therewithin a power input shaft **16**. Suitable bearings are provided so that shaft **16** may rotate about its longitudinal axis. As shown more clearly in FIGURE 2, one end of the shaft **16** is connected to a sprocket **20**. Sprocket **20** is mechanically coupled to a sprocket **24** by means of a chain **22**.

The sprocket **24** is provided on a horizontally disposed shaft **26** supported from the base **12** by means of a bracket **28**. A pulley **30** on shaft **26** is connected to the output pulley of a motor **34** by an endless belt **32**. Other equivalent devices may be utilized to couple the rotary output of motor **34** to the shafts **16** and **26**.

As shown more clearly in FIGURE 2, there is provided a yoke **36** having spaced arms **38** and **40**. The shaft **16** extends through aligned holes in the arms **38** and **40**. Suitable bearings are provided on the shaft **16** so that the arms **38** and **40** are rotatable about the longitudinal axis of shaft **16**, but are not connected to shaft **16** for rotation therewith. Cams **42** and **44** are provided on shaft **16** between the yoke arms **38** and **40**. Cams **42** and **44** are connected to the shaft **16** for rotation therewith. This may be expeditiously accomplished by interconnecting the cams by pins as shown and connecting cam **44** to shaft **16** by means of a set screw.

As shown more clearly in FIGURE 3, the support arm **46** is supported by the shaft **16** between yoke arm **40** and sleeve **18**. Arm **46** is provided with a suitable bearing so that it does not rotate with shaft **16**. The end of arm **46** remote from shaft **16** is provided with a pin **50** pivotably coupled to link **48**. One end of link **48** is provided with a rotatable cam follower **52** engaging the outer periphery of cam **44**.

The end of link **48** remote from cam follower **52** is pivotably coupled to link **54** by pin **56**. Link **54** is pivotably coupled to the yoke **36** by pin **58**. Thus, cam **44** causes yoke **36** to move through an arc about the longitudinal axis of shaft **16**.

The lower end of yoke **36** is provided with a journal **60** receiving a shaft **62**. A connecting arm **64** is fixedly secured to shaft **62** and pivotably connected to a main

connecting arm **65**. Connecting arm **65** is adjustably connected to a connecting rod **66**. The end of rod **66** remote from arm **64**, as shown more clearly in FIGURE 1, is provided with a clevis pivotably connected to a link **68** by means of a pin **70**.

The link **68** is pivotably connected to the yoke arm **38** by means of a pin **72**. A cam follower **74** is rotatably supported by the link **68** and engages the outer periphery of the cam **42**. A spring **76** has one end connected to a pin **78** as shown more clearly in FIGURE 1. The other end of spring **76** is connected to the arm **65** as shown more clearly in FIGURE 2.

As shown more clearly in FIGURE 5, a scoop shaft holder **80** is connected to one end of the shaft **62**. A scoop shaft **82** is adjustably connected to the holder **80** and terminates at its lower end in a scoop **84**. As shown more clearly in FIGURE 4, the scoop **84** extends into a funnel **86**.

The scoop **84** is adapted to remove controlled amounts of powder from a powder receptacle **88**. Powder receptable **88** is desirably made from or lined with plastic or some other material which will avoid possibility of creating sparks due to contact with the scoop **84**. The receptacle **88** is supported by a plate **89** connected to the upper end of a shaft **90** suitably journalled on the base **12**.

As shown more clearly in FIGURE 4, the longitudinal axis of shaft **90** and receptacle **88** is inclined approximately 15 degrees with respect to a vertical line perpendicular to base **12**. The lower end of shaft **90** is connected to gear **92** meshingly engaged with a worm **94**. Worm **94** is on shaft **26** and rotates therewith. As a result thereof, the receptacle **88** will rotate about its longitudinal axis and the longitudinal axis of shaft **90** so as to constantly vary the location of powder therein to be removed by the scoop **84**.

Adjacent the receptacle **88**, there is provided a rake-off assembly designated generally as **96**. Assembly **96** includes a pair of spaced parallel arms **98** and **100** connected adjacent their lower ends by means of a pin **102**. The ends of pin **102** are journalled in blocks **104** and **106** on the upper surface of base **12**. An adjusting screw **108** is provided on the arm **98** so as to adjust the general position of the rake-off bar **110**.

Rake-off bar **110** is in engagement with a connecting member **112** extending between the arms **98** and **100**. A plate **114** overlies a portion of the bar **110**. Gross adjustments of the bar **110** can be made by means of screws **116**. Minor adjustments of the elevation of bar **110** are effected by means of screw **108**.

The operation of the scooper **10** is as follows.

The motor **34** continuously rotates the shafts **16** and **26**. As a result thereof, the receptacle **88** is continuously rotating about its longitudinal axis and cams **42** and **44** are rotating with shaft **16**. As cam follower **52** follows the contour of cam **44**, link **48** is caused to pivot about pin **50** and thereby cause the lower end of yoke **36** to move toward and away from the open top of receptacle **88**.

As cam follower **74** follows the contour of cam **42**, link **68** pivots about pin **72** and through rod **66**, arm **65**, arm **64**, shaft **62** and holder **80**, the scoop shaft **82** is moved from the generally vertical disposition shown in FIGURES 1 and 4 to a generally horizontal disposition shown in phantom in FIGURE 4. The sequence of movements is as follows: the lower end of yoke **36** is caused to move to the left in FIGURE 1 so that the scoop shaft **82** may assume a generally horizontal position, then the scoop shaft and scoop are moved into the open end of the receptacle **88**, powder enters scoop **84**, the scoop arm **82** and scoop **84** are raised while being withdrawn so that the upper edge of the scoop **84** passes adjacent to the lower edge of bar **110** so that the amount of powder in scoop **84** may be regulated. As the position of shaft **62** approaches that in the solid

lines in FIGURE 4, the scoop **84** descends so as to discharge the powder into the funnel **86**. The general path of travel for the scoop **84** is illustrated with phantom lines and arrows in FIGURE 4.

The repetitive rate of the cycle may be varied depending upon the speed of rotation of shaft **16**. Rotation of shaft **90** is desirably slow so as not to lose powder due to centrifugal action. Means not shown are provided to continuously or intermittently introduce powder into the receptacle **88** without interferring with the rake-off assembly **96**. The rake-off bar **96** is preferably adjustable so that the correct level of powder is permitted to remain within the scoop **84**. When the scoop **84** is initially raised from the receptacle **88**, it is overcharged with powder, thereby preventing a situation occurring wherein the scoop **84** will withdraw an amount of powder which is less than the desired amount.

The disposition of the powder discharged into funnel **86** may assume a wide variety of uses. In connection with explosive powder, the funnel **86** may direct the powder into a detonator-loading machine which repetitively presents receptacles beneath the funnel **86** to receive the powder charge.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims, rather than to the foregoing specification as indicating the scope of the invention.

I claim:

1. An automatic powder scooper comprising an open top powder receptacle, a scoop adjacent said receptacle, means connected to said scoop for causing the scoop to move toward and away from said receptacle so that it may remove powder from said receptacle and for pivoting said scoop about a substantially horizontal axis laterally spaced from said receptacle so that it may discharge the powder withdrawn from the receptacle, and an adjustable rake-off bar above the receptacle for controlling the amount of powder on the scoop.

2. A scooper in accordance with claim **1** including a funnel supported below said receptacle and adjacent thereto for receiving powder from said scoop, said scoop being at least partially disposed within said funnel when discharging powder.

3. An automatic powder scooper comprising an open top powder receptacle, a scoop adjacent said receptacle, means connected to said scoop for causing the scoop to move toward and away from said receptacle so that it may remove powder from said receptacle and for pivoting said scoop about a substantially horizontal axis so that it may discharge the powder withdrawn from the receptacle, a rake-off bar above the receptacle for controlling the amount of powder on the scoop, and means connected to the receptacle for rotating the receptacle about an upright axis.

4. An automatic powder scooper comprising an open top powder receptacle, a scoop adjacent said receptacle, means connected to said scoop for causing the scoop to move toward and away from said receptacle so that it may remove powder from said receptacle and for pivoting said scoop about a substantially horizontal axis so that it may discharge the powder withdrawn from the receptacle, a rake-off bar above the receptacle for controlling the amount of powder on the scoop, said means including a first cam for causing said scoop to pivot about said axis and a second cam for causing said scoop to move toward and away from said receptacle.

5. An automatic powder scooper comprising an open top powder receptacle, a scoop adjacent said receptacle, means connected to said scoop for causing the scoop to move toward and away from said receptacle so that it may remove powder from said receptacle and for pivoting said scoop about a substantially horizontal axis so that it may discharge the powder withdrawn from the

receptacle, a rake-off bar above the receptacle for controlling the amount of powder on the scoop, a rake-off bar assembly supporting said bar for pivotable movement about an axis disposed to one side of said receptacle, and means for adjusting the vertical position of said bar with respect to the top of said receptacle.

6. An automatic powder scooper comprising an open top powder receptacle, a scoop adjacent said receptacle, means connected to said scoop for causing the scoop to move toward and away from said receptacle so that it may remove powder from said receptacle and for pivoting said scoop about a substantially horizontal axis so that it may discharge the powder withdrawn from the receptacle, a rake-off bar above the receptacle for controlling the amount of powder on the scoop, said means including a power input shaft having first and second cams thereon, a linkage interconnecting said first cam and said scoop to effect movement of the scoop toward and away from the receptacle, linkage interconnecting said scoop and second cam to effect pivotable movement of the scoop about said axis.

7. A scooper in accordance with claim 6 including a yoke supported by said power input shaft, said scoop being supported by a scoop shaft, said scoop shaft being supported by the lower end of said yoke, and said first-mentioned linkage being connected to said yoke to effect pivotable movement of said yoke with respect to said power input shaft.

8. A scooper in accordance with claim 6 including a scoop shaft, said scoop being connected to one end of said scoop shaft, said scoop shaft being coupled to a horizontally disposed shaft, said second-mentioned linkage being connected to said horizontally disposed shaft to effect rotation of the same, thereby causing said scoop to pivot about said horizontal axis.

9. A scooper in accordance with claim 7 wherein said second-mentioned linkage is connected to said yoke and adapted to move the scoop relative to the yoke.

10. An automatic powder scooper comprising an open top powder receptacle, a scoop adjacent said receptacle, means connected to said scoop for causing the scoop to move toward and away from said receptacle so that it may remove powder from said receptacle and for pivoting said scoop about a substantially horizontal axis so that it may discharge the powder withdrawn from the receptacle, a rake-off bar above the receptacle for controlling the amount of powder on the scoop, said means including a motor, a power input shaft connected to said motor and having cams for effecting said movements of the scoop, and means connecting said motor to said receptacle for simultaneously rotating said receptacle about an upright axis.

11. An automatic powder scooper comprising an open top powder receptacle, a scoop adjacent said receptacle, actuating means connected to said scoop for causing the scoop to move toward and away from said receptacle also that it may remove powder from said receptacle and for pivoting said scoop so that it may discharge the powder withdrawn from the receptacle, means connected to the receptacle for rotating the receptacle, a rake-off assembly supporting a rake-off bar adjacent said receptacle, and means for adjusting the vertical position of said bar with respect to the top of said receptacle.

12. A scooper in accordance with claim 11 wherein said actuating means includes a first cam for causing said scoop to pivot about said axis and a second cam for causing said scoop to move toward and away from said receptacle.

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STANLEY H. TOLLBERG, *Primary Examiner.*