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Anderson et al.

[11] **3,815,501**

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[54] **APPARATUS FOR COMPACTING MATTER WITHIN A CONFINED AREA**

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[52] **U.S. Cl.** ..... **102/24 R**

[51] **Int. Cl.** **F42b 3/00**

[58] **Field of Search** ..... 102/20, 21.8, 24 R, 26

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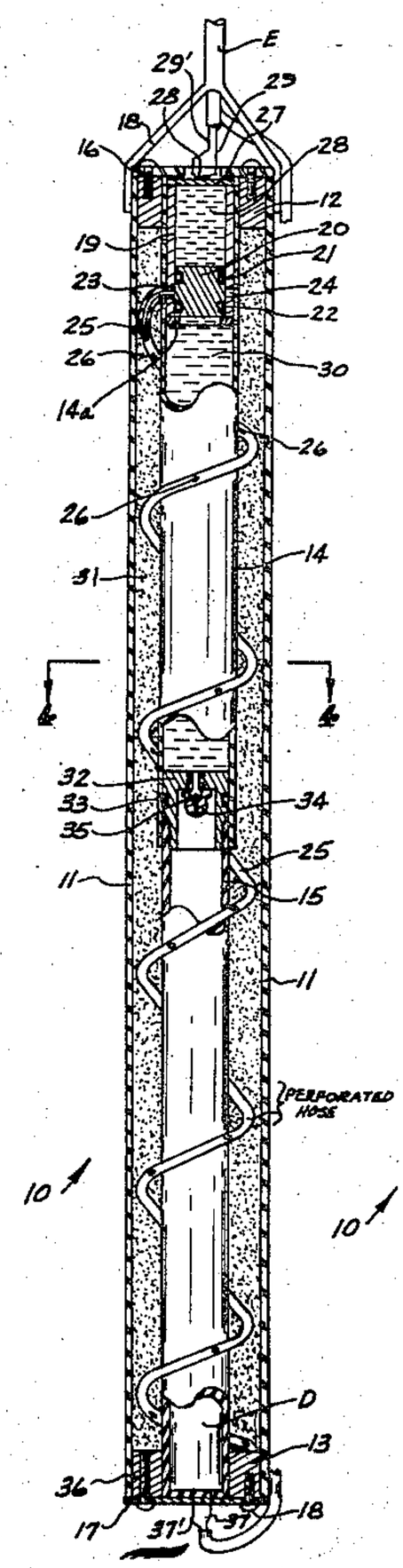
[57] **ABSTRACT**

A self compacting explosive cartridge for use in bore-holes. The cartridge is formed from rigid, upper and lower telescoping tubes which extend centrally through a larger diameter sleeve of flexible material. Prilled ammonium nitrate fills the annular space between the tubes and the sleeve; the upper tube is filled with diesel fuel and the lower tube contains a detonator. When remotely activated by a signal, compressive means included in the cartridge telescope the tubes together which foreshortens the cartridge and displaces the fuel from the upper tube into the ammonium nitrate causing the two chemicals to combine to form an explosive mixture. The foreshortening or setting of the apparatus compacts the explosive material in the bore-hole. The preferred form of the invention obtains the force for setting the cartridge from a stretched outer sleeve of resilient material. A modified form of the invention supplies the setting force with a tension coil spring concentrically disposed about the telescoping tubes. Another modification supplies the setting force with stretched rubber bands which connect the two ends of the cartridge to each other.

26 Claims, 10 Drawing Figures



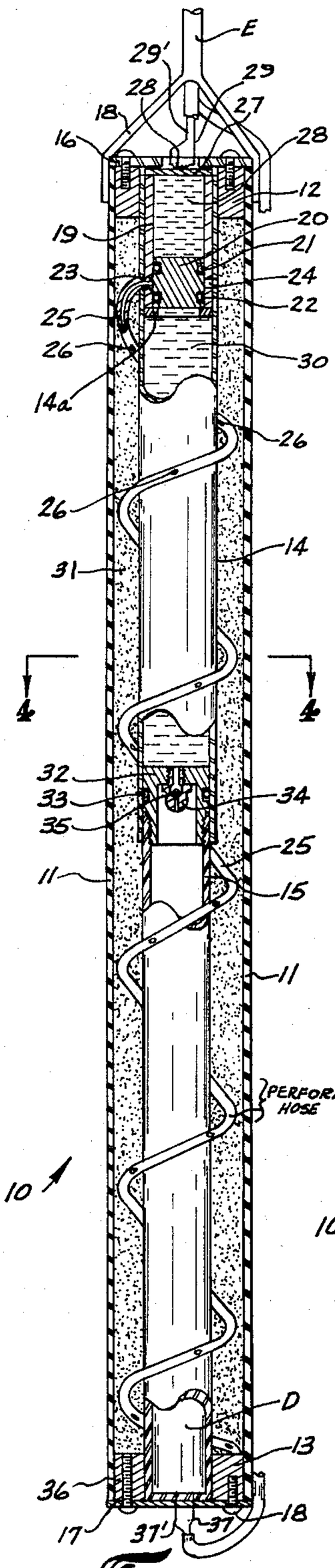


Fig. 3

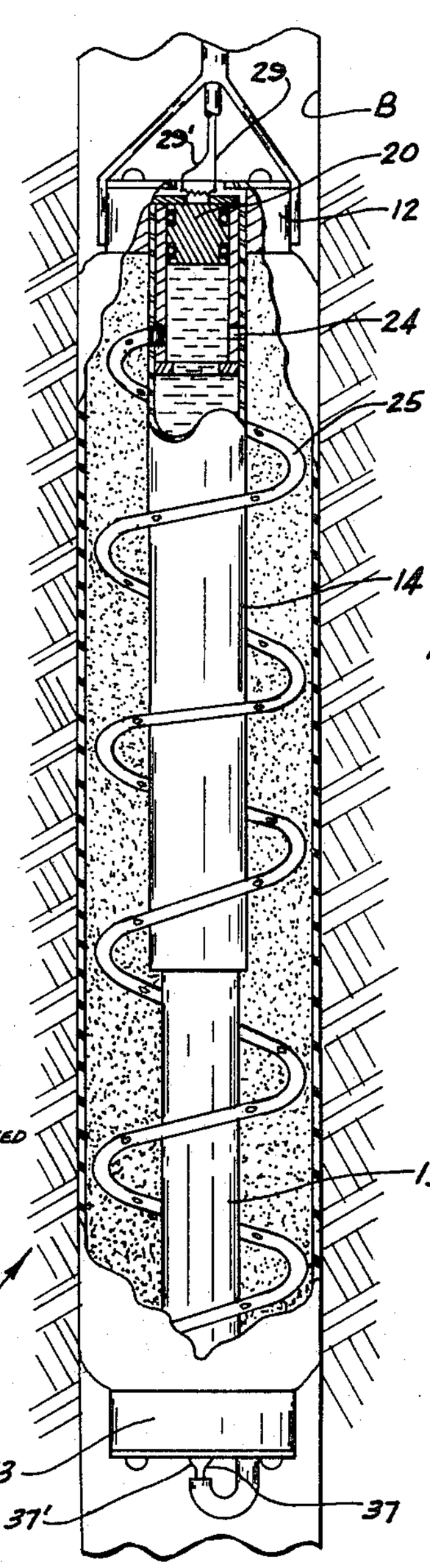


Fig. 5

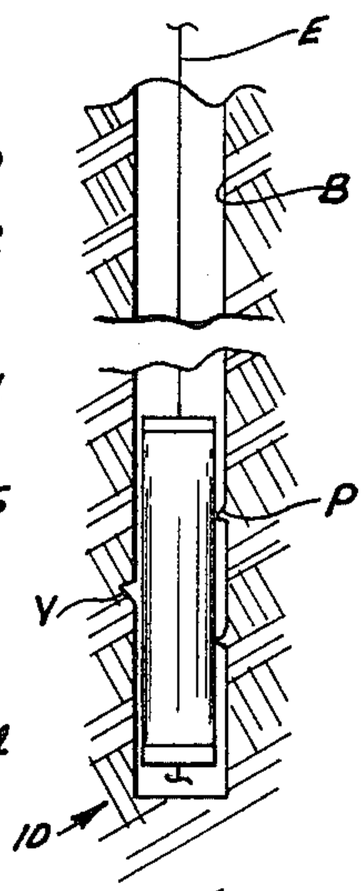


Fig. 1

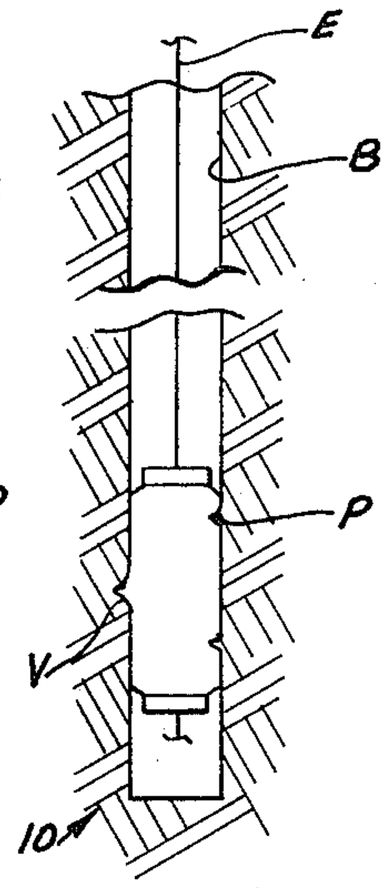


Fig. 2

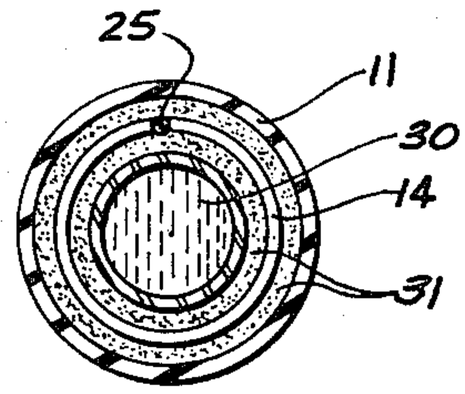


Fig. 4

Fig. 6

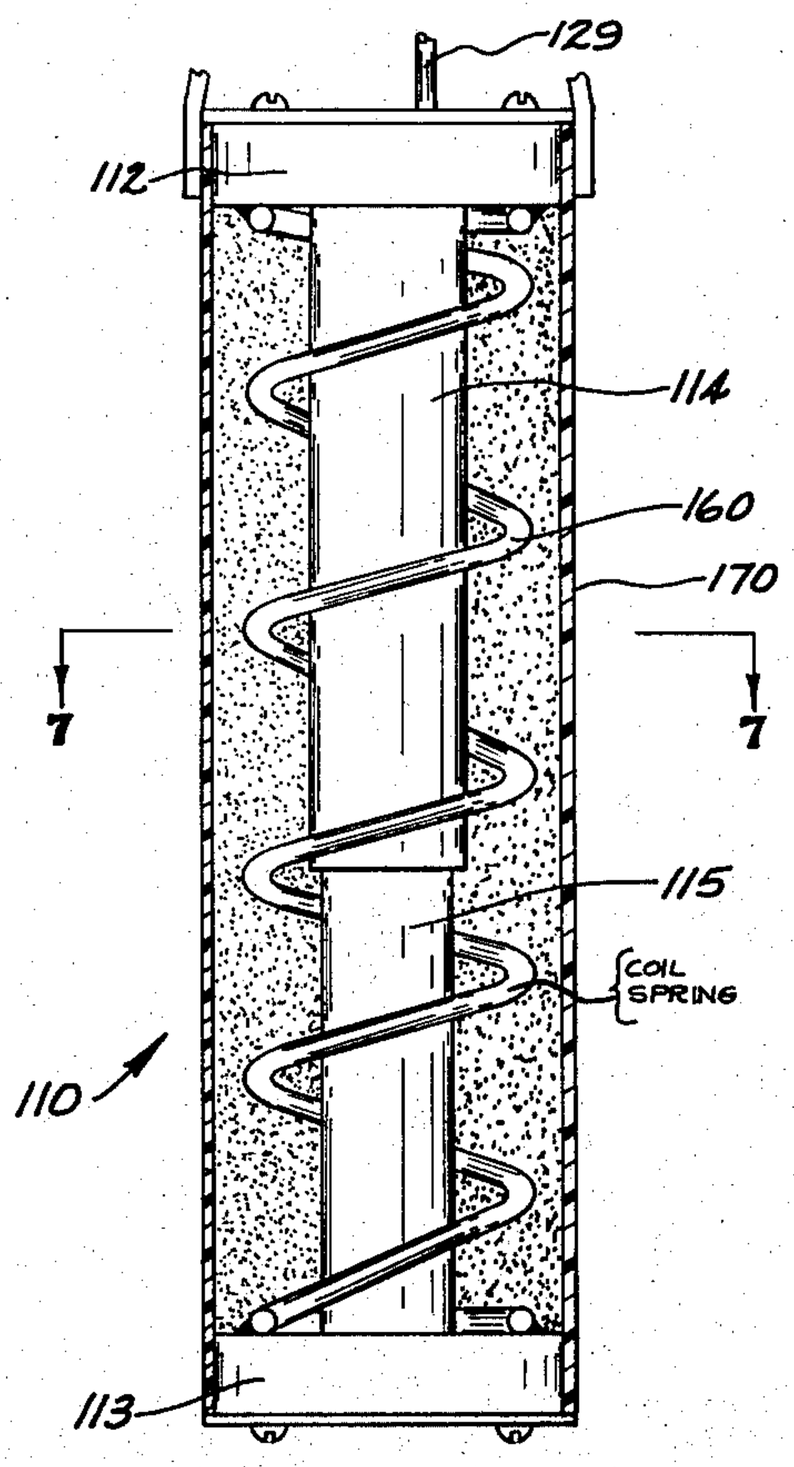
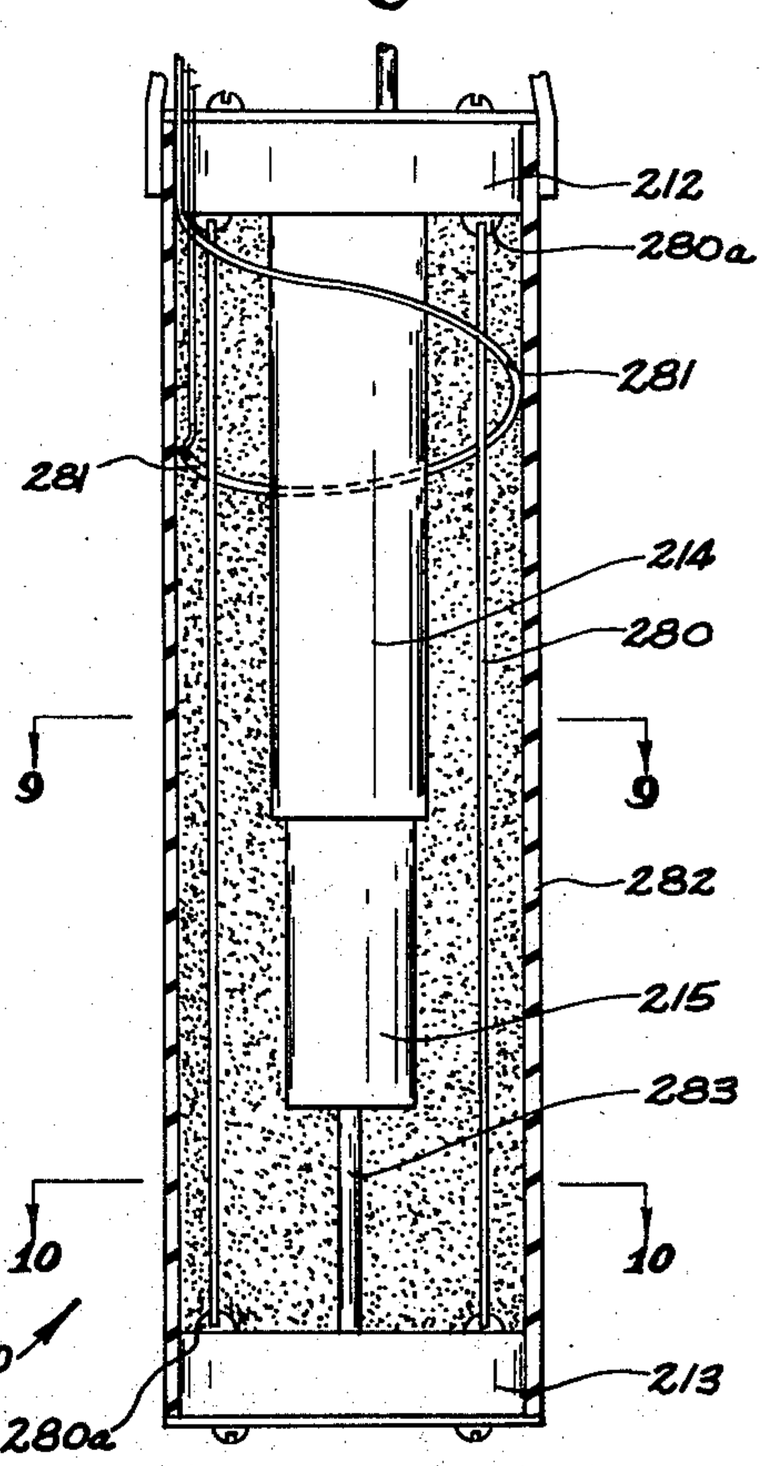


Fig. 8



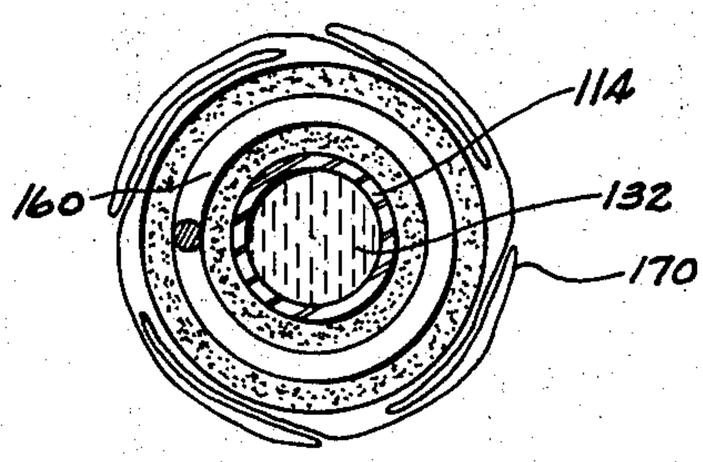


Fig. 7

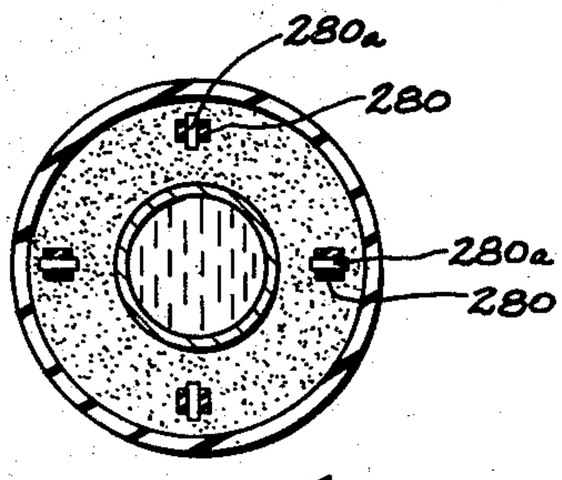


Fig. 9

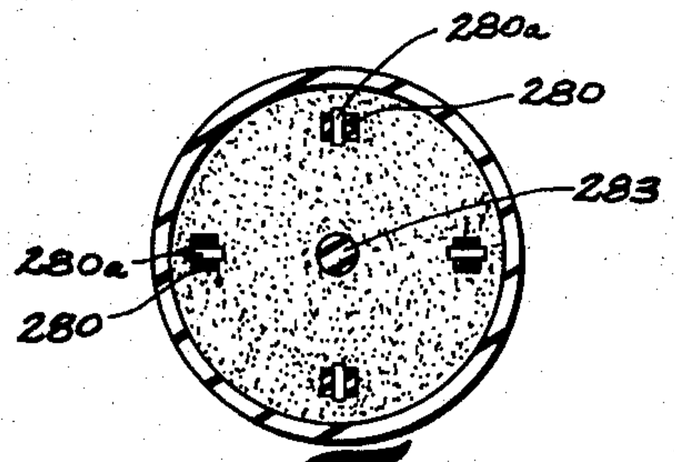


Fig. 10

APPARATUS FOR COMPACTING MATTER WITHIN A CONFINED AREA

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to the formation and compacting of explosive materials within confined areas. In a specific application of the present invention, the field of the invention relates to means for placing non-explosive materials in a bore-hole, combining the materials in place to make an explosive mixture and automatically compacting the explosive mixture within the bore-hole.

2. Description of the Prior Art

It is well known that to obtain maximum effectiveness from explosives placed in confined areas such as bore-holes, it is necessary to compact the explosive within the area. When properly placed and tamped, a minimum amount of explosive can be employed. By reducing the amount of explosive necessary to perform a given job, the cost of the explosive is reduced and the expense and time associated with bore-hole drilling and explosives placement are also significantly reduced. Conventionally, such compacting is performed by manually tamping a loose explosive mixture positioned at the bottom of the bore-hole. The manual tamping is effected by long rods manipulated by an operator at the bore surface. The technique is both time consuming and dangerous.

In some situations, the explosive cannot be reached by manual tamping equipment and the only alternative is to detonate the explosive in its relatively loosely packed form.

Another well known problem associated with the use of explosives results from the fact that the explosives may be accidentally detonated while being handled, thus making them extremely dangerous. This danger imposes restrictions on the handling and shipment of explosives. In addition, explosives have a limited storage life because of oxidation and other chemical changes in the mixture. These chemical changes may make the explosive materials unpredictable and unreliable, thus also contributing to their dangers.

One known prior art device encloses explosive material in a flexible sleeve which in turn is carried within a rigid outer sleeve. The assembly is lowered into a bore-hole and when the proper position is reached, the metal sleeve is raised through the bore-hole to permit the explosive mixture within the flexible sleeve to expand outwardly. The expansion is effected solely by gravity settling of the explosive materials causing the flexible sleeve to bulge outwardly. Very little compressive or tamping effect is accomplished by the technique. Removal of the rigid outer sleeve complicates the procedure and may be extremely difficult under some circumstances. Moreover, the prior art technique would not be suited for horizontal bore-holes since the gravity effect would not cause radial compaction.

SUMMARY OF THE INVENTION

The present invention provides a self compacting explosive charge which until set or compacted is unable to explode. This is done by employing separate chemicals which individually are non-explosive but when combined produce an explosive mixture.

The self compacting aspect of the present invention is accomplished by the use of tensioned means which set the cartridge by drawing two ends of the cartridge toward each other to permit or cause radial expansion of a flexible sleeve extending between the two ends. In its initial, unset condition, the apparatus of the present invention has a relatively slim radial contour so that it can be lowered easily through a small bore-hole. The cartridge is set on command from a remote signal which causes the cartridge to contract axially causing a radial expansion. During this movement the separate cartridge materials are mixed, the mixture is increased in density and compacted tightly against the surrounding bore-hole wall. The self compacting ability is independent of gravity and the cartridge of the present invention may be used in vertical or horizontal bore-holes.

The surrounding outer sleeve may be formed of an elastic or resilient material which is placed in tension and elongated when the cartridge cylinder is in its unset condition. The tension in the outer sleeve in one embodiment of the present invention provides the force tending to draw the two ends of the cartridge together. In other embodiments, a coil spring or bands of elastic or resilient material may provide the force for drawing the ends of the cartridge toward each other to effect radial expansion of the explosive mixture.

The unset cartridge is held in its elongated position by upper and lower telescoping tubes. Diesel fuel oil trapped in the upper tube forms a fluid lock preventing movement of a piston secured to the lower tube which prevents the two tubes from telescoping together under the influence of the compressing means. A remote surface control signal is employed to release the fluid lock and contraction of the tensioned resilient means draws the piston through the upper tube to displace the fluid into the annular space between the tubes and the surrounding sleeve. Prilled ammonium nitrate is in the annular space and when the fluid mixes with the prills, an explosive mixture is formed. The mixture may be detonated by an electrical signal which ignites a detonator preferably carried within the lower tube.

In one embodiment of the invention, a perforated, coiled tube extends through the prilled material in the annular area. When triggered from the surface, the fluid is released into the tube and evenly disbursed throughout the prills to uniformly mix the two chemicals.

The resilient or flexible outer sleeve permits the explosive charge to fully conform to the contour of the surrounding bore wall so that optimum effect is obtained from the explosion of the materials within the cartridge. Where means other than the outer sleeve are employed for providing the tensioning or compressive tamping force, the outer sleeve may be provided by any suitable flexible material which can maintain a relatively small radial contour when elongated and yet will be able to expand radially outwardly when foreshortened axially.

From the foregoing it will be appreciated that a primary object of the present invention is to provide a self compacting explosive cartridge which will expand into contact with the walls of a confined area such as a bore-hole.

A related object of the present invention is to automatically increase the density of an explosive mixture in a confined area. Yet another object of the present

invention is to provide an explosive cartridge which, until compacted, is incapable of being exploded.

It is an important object of the present invention to provide a means for depositing a maximum amount of explosive materials in a given area with a means which may be easily positioned in the area, automatically compacted and thereafter be remotely activated.

These and other objects, advantages and features of the present invention will be more readily understood from the following description, the related drawings and the claims.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a vertical cross sectional view schematically illustrating an unset seismic cartridge made in accordance with the teachings of the present invention as it appears when it is initially positioned in a bore-hole;

FIG. 2 illustrates the bore-hole cartridge of FIG. 1 as it appears following self compaction or setting;

FIG. 3 is a vertical elevation partially in section illustrating details of a preferred form of the self compacting cartridge of the present invention in its initial unset position before self compaction;

FIG. 4 is a cross sectional view of the cartridge of the present invention taken along the line 4—4 of FIG. 3;

FIG. 5 is a view of the apparatus illustrated in FIG. 3 shown in self compacted position in a surrounding bore-hole;

FIG. 6 is a vertical elevation illustrating a modified form of the present invention;

FIG. 7 is a horizontal cross section taken along the line 7—7 of FIG. 6;

FIG. 8 is a vertical elevation, partially in section, illustrating a third modification of the present invention;

FIG. 9 is a horizontal cross section taken along the line 9—9 of FIG. 8; and

FIG. 10 is a horizontal cross sectional view taken along the line 10—10 of FIG. 8.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENTS

A typical anticipated application of the apparatus of the present invention is illustrated in FIG. 1 where a cartridge indicated generally at 10 is shown in position within a bore-hole B. The cartridge is suspended in the bore-hole by a line E which extends to the surface of the bore-hole. The line E may contain one or more electrical conductors as required to provide the necessary signals for controlling the cartridge 10.

FIG. 2 illustrates the cartridge 10 expanded radially outwardly into firm engagement with the wall of the surrounding bore-hole B. In its set or compacted form, the cartridge 10 extends closely about projections P and fills voids V while simultaneously increasing the density of the explosive material contained within the cartridge, thereby performing the necessary functions of a tamping operation. The contents of the cartridge cannot be exploded until the cartridge is set thus preventing inadvertent explosion during handling or placement. Once the cartridge 10 has been set as illustrated in FIG. 2, the materials within the cartridge are conditioned to be exploded by activating a detonator (not illustrated) in the cartridge with an electrical signal provided over the line E.

FIG. 3 illustrates details in the construction of the preferred form of the cartridge of the present invention. In FIG. 3, the cartridge 10 is illustrated in unset, unactivated condition as it appears during storage and handling and during its descent into the bore-hole. The cartridge 10 includes an outer sleeve 11 of elastic or resilient material such as butyl rubber or other suitable material. The sleeve extends between upper and lower end pieces 12 and 13 respectively. Within the sleeve 11, an upper tubular member 14 is secured to the end piece 12 and extends centrally through the chamber 10 and telescopes over a second tubular member 15 which in turn is secured to the lower plate 13. The tubular members 14 and 15 have a circular cross section and are preferably formed of aluminum tubing or other suitable rigid material. Upper and lower end plates 16 and 17 respectively are secured to the end pieces 12 and 13 by small screws 18 or other suitable means. The plates 12 and 13 are provided with central bores which surround the ends of the tubes 14 and 15 respectively; and the plates 16 and 17 prevent the tubes from sliding through the end pieces of the cartridge as it is set. The sleeve 11 may be bonded to the end pieces 12 and 13 by a chemical adhesive, nailing, stapling or by any other suitable means.

At the upper end of the cartridge 10, a tubular insert 19 is disposed within the upper end of the tube 14 and an internal tube shoulder 14a holds the insert in position within the tube. A cylindrical piston 20, positioned within the central opening of the insert 19, is equipped with upper and lower O-ring seals 21 and 22 positioned initially above and below the tube openings 23 and 24. The opening 23 communicates with a small, flexible hose 25 which is constructed of butyl rubber, polyvinyl chloride or other suitable flexible material. The hose 25 extends helically through the annular area between the sleeve 11 and the tubes 14 and 15 and connects to the lower piece 13. Small holes or perforations 26 are formed throughout the entire length of the hose 25 for a purpose to be described.

A release disc 27 secured to the upper end of the tubular insert 19 by any suitable means forms a hydraulic chamber 28 which is filled with a suitable liquid such as water. The O-Ring seal 21 forms a seal with the surrounding tubular insert 19 to prevent the fluid in the chamber 28 from entering the tube 14 or flowing through the holes 23 or 24. The release disc 27 is preferably constructed of a heat disruptable material which has sufficient structural strength to confine a pressurized fluid in the chamber 28. An electric heating coil 28 is secured to the disc 27 and an electrical line 29 which is included as part of the line E is electrically connected to the coil 28. A second line 29′ connects to the coil 28 to complete the electrical circuit. The line E may be physically secured to the cartridge 10 in any desired manner.

The internal area of the upper tube 14 is filled with a fluid 30 which, when combined with a prilled chemical 31 in the annular area between the tubes 14 and 15 and the outer sleeve 11 produces an explosive material. The fluid 30 is preferably diesel fuel oil which is comprised primarily of mixed alophatic hydrocarbons and the material 31 is preferably prilled ammonium nitrate. It will be appreciated however that other materials may be substituted for the diesel fuel oil and the ammonium nitrate with the requirement being that neither material

alone is explosive but that the mixture of the materials is explosive.

At the lower end of the tube 14, a piston 32 is secured to the upper end of the lower tube 15. The piston 32 is received within the tube 14 and an annular O-ring seal 33 provides a continuous, sliding engagement between the piston and the surrounding tube. A fitting 34 such as a grease fitting or other suitable means is carried in the piston 32 and is employed to fill the tube 14 with diesel fuel. A ball 35 functions in a conventional manner as a check valve to prevent reverse flow of the fluid injected into the tube 14 through fitting 34. It will be appreciated that the fitting 34 may be positioned at any suitable location and need not be carried on the piston 32.

At the lower end of the cartridge 10, one or more axial fill openings are formed in the lower end piece 13 to be employed for inserting the material 31 into the annular space between the tubes and the outer sleeve. A removable plug 36 is threadedly engaged with the fill opening after the annular space has been filled.

During the initial assembly of the cartridge 10, before adding the diesel fuel 30 and the ammonium nitrate 31, the tube 15 is telescoped within the surrounding tube 14 substantially in the position shown in FIG. 5. The normal, untensioned cross sectional diameter of the rubber sleeve 11 is greater than that of the cross sectional area of the bore-hole within which the cartridge is to be received. A suitable pressurized source of diesel fuel is connected to the filling 34 and the fuel is injected into the tube 14. As the fluid 30 fills the tube, the piston 32 is displaced toward the lower end of the tube 14 and the end pieces 13 and 12 are moved axially away from each other. The resiliency of the sleeve permits it to be stretched into the form illustrated in FIG. 3 where it is in tension, attempting to draw the two end pieces 12 and 13 back together.

After the chamber containing the fluid 30 has been filled and the piston 32 is in the position illustrated in FIG. 3, the source of pressurized diesel fuel may be removed and the check valve 35 prevents the fluid from escaping. The O-ring seal 22 on the upper piston 20 prevents escape of the diesel fuel oil 30 from the upper end of the tube and the seal 33 on the piston 32 traps the fluid at the lower end of the tube to provide a fluid lock which keeps the elastic outer sleeve in its tensioned condition and the fuel oil under pressure. When stretched into the position shown in FIG. 3, the cross sectional diameter of the sleeve 11 is inherently reduced so that a relatively slim cartridge contour is obtained.

A conventional cylindrical booster cartridge D is inserted into the tube 15. Electrical leads 37 and 37' from the line E are connected to the detonator through the base plate 17 which in turn is then secured to the bottom of end piece 13 by screws 18. The annular area between the tubes and the surrounding sleeve may then be filled by pouring the prilled material 31 through the fill hole provided in the end piece 13. When the annular area has been completely filled, the plug 36 is repositioned and the cartridge is loaded and ready to be used.

The loaded cartridge is lowered through a bore-hole to the desired sub-surface location by the line E. While only a single cartridge 10 is illustrated connected to the line E, a plurality of such cartridges may be suspended from the line and activated to explode sequentially. Once the desired depth has been reached, a suitable electrical current is conveyed through the line E to the heating coil 28 over the electrical conductor 29. The heat produced by the heating coil 28 causes the release disc 27 to rupture which in turn permits the water or other liquid contained in the chamber 28 to be released. Release of the pressure in the chamber 28 permits the piston 20 to slide upwardly through the chamber under the influence of the pressure exerted by the diesel fuel oil 30. When the lower O-ring 22 has been moved axially above the openings 23 and 24, the diesel fuel oil 30 is displaced from the tube 14 through the openings. Preferably, the opening 24 is slightly constricted so that a portion of the fluid is forced through the small hose line 25 where it is disbursed from the perforations 26 throughout the length of the cartridge. The hose 25 is coiled and flexible so that it will move with the cartridge as the cartridge is initially elongated and thereafter foreshortened during the tamping operation. The hose 25 may be omitted but is desirable for use where the chemicals to be combined do not readily mix. With the use of diesel fuel and prilled ammonium nitrate, the hose 25 is not needed since the inherent absorbing quality of the ammonium nitrate and the pressurized disbursement of the diesel fuel cause the two materials to completely combine to form a uniform explosive material.

As the two tubes are telescoped together under the influence of the tensioned outer sleeve, the sleeve expands radially and contracts axially and the exposive mixture follows to form a compacted mass in the borehole. FIG. 5 illustrates the cartridge 10 in its compacted condition. Thereafter, a suitable electrical signal applied through the electrical lines 37 and 37' detonates the booster cartridge D which in turn detonates the explosive mixture to produce the desired explosion.

FIG. 6 illustrates a modified cartridge form indicated generally at 110. The cartridge 110 is similar in basic operation to that already described for the cartridge 10. Components in the cartridge 110 which are similar to those already described for the cartridge 10 are identified by a reference character which is 100 higher than that for the corresponding component of the cartridge 10. The cartridge 110 includes a coil spring 160 which is secured to the upper and lower end pieces 112 and 113 respectively and extends axially about the tubes 114 and 115. A pleated outer sleeve 170 encircles the cartridge 110 and is formed of sheet material made of polyvinyl chloride or other suitable material. Construction of the pleats is illustrated in FIG. 7.

The cartridge 110 obtains the compressive tamping force from the coil spring 160 which is stretched into tension as the diesel fuel is inserted into the tube 114. With the center support structure elongated, the pleats in the sleeves 170 function to maintain a desired small cross sectional area. Once the cartridge is properly positioned, release of the hydraulic lock permits the spring 160 to draw the upper and lower ends 112 and 113 toward each other causing an intermixture of the prilled and fluid chemicals. The pleats in the sleeve 170 unfold to permit the sleeve to extend radially outwardly as the two end pieces 112 and 113 are brought toward each other.

FIG. 8 illustrates a third modification of the present invention indicated generally at 210. Similar components in the FIG. 8 modifications are identified with

reference characters which are 200 higher than those identifying the corresponding component in the apparatus 10. The cylinder 210 differs from those previously described primarily in that a series of rubber bands 280 are employed to provide the compressive tamping force which draws the two ends 212 and 213 toward each other.

A steel wire 281 is secured to the inner surface of a bag 282 acts as a safety means employed in deactivating the chemicals in the cartridge 210. The wire 281 is connected to electrical lines (not shown) extending from the surface. When supplied with an electrical current, the wire becomes hot and ruptures the bag 282. Water or other disintegrating chemical may then be inserted into the bore-hole to mix with the cartridge chemicals to render the cartridge non-explosive.

Brads 280*a* or other suitable means may be employed to secure the rubber bands to the upper and lower end pieces 212 and 213 respectively. The bag 282 may be constructed of any suitable flexible material which can be expanded from a relatively slim configuration to one which will completely engage the walls of the surrounding bore-hole.

The lower tube 215 of the cartridge 210 is shortened to permit more chemicals to be carried within the bag 282. A smaller booster cartridge (not illustrated) is inserted in the shortened tube 215 to initiate the detonation of the cartridge. The tube 215 is connected to the lower end piece 213 by a rod 283 which transmits axial movement of the end piece to the tube.

The foregoing disclosure and description of the invention is illustrative and explanatory thereof, and various changes in the size, shape and materials as well as in the details of the illustrated construction may be made within the scope of the appended claims without departing from the spirit of the invention.

We claim:

1. Apparatus for compacting matter within an area having confining boundaries comprising:
   a. an axially extending, laterally expandable outer housing means having first and second axial end means;
   b. compactable matter contained within said housing means;
   c. self-contained powering means closely connected with said housing means for moving said end means compact said matter; and
   d. control means for activating said powering means.

2. Apparatus as defined in claim 1 wherein:
   a. said compactable matter includes unmixed materials; and
   b. mixing means are included in said housing means for combining said unmixed materials whereby said matter, when compacted, includes a mixture of said materials.

3. Apparatus as defined in claim 1 wherein said powering means includes a resilient tubular sleeve means extending axially between said first and second axial end means.

4. Apparatus as defined in claim 1 wherein:
   a. rigid, axially contractable support means extend axially within said housing between said first and second axial end means;
   b. said powering means includes resilient tension means connected to said first and second axial end means tending to draw said end means axially toward each other against the restraining force provided by said support means; and
   c. said control means include release means operable to permit said support means to axially contract whereby said matter is compacted within said area.

5. Apparatus as defined in claim 4 wherein:
   a. said support means include a cylinder containing a first material connected to said first end means and a piston connected to said second end means, said piston being movable to displace said first material from said cylinder; and
   b. said control means includes remotely operable release means to open outlet port means in said cylinder to permit said piston to move through said cylinder whereby said first material is displaced from said cylinder into an area within said housing containing a second material whereby said first and second materials may be mixed.

6. Apparatus for compacting matter within an area having confining boundaries comprising:
   a. an axially extending, laterally expandable outer housing means having first and second axial end means;
   b. rigid, axially contractable support means extending axially within said housing means between said first and second end means, said support means including a cylinder means, containng a first material, connected to said first end means and a piston means connected to said second end means, said piston means being movable to displace said first material from said cylinder means;
   c. compactable matter contained within said housing means;
   d. powering means contained within said housing means for moving said end means to compact said matter, said powering means including resilient tension means connected to said first and second axial end means tending to draw said end means axially toward each other against the restraining force provided by said support means; and
   e. control means for activating said powering means, said control means including release means operable to permit said support means to axially contract whereby said matter is compacted within said area and further including remotely operable release means to open outlet port means in said cylinder means to permit said piston means to move through said cylinder means whereby said first material is displaced from said cylinder means into an area within said housing means containing a second material whereby said first and second materials may be mixed.

7. Apparatus as defined in claim 6 wherein:
   a. said cylinder includes a first tubular member;
   b. said piston is connected with a second tubular member adapted to telescope within said first member;
   c. said control means includes a release piston held in position by pressurized release fluid in a release chamber and operable when moved to open said outlet port means; and
   d. said release chamber includes rupturable, fluid release means operable from a remote location to relieve the pressure on said pressurized releae fluid whereby said release piston may move to open said outlet port means.

8. Apparatus as defined in claim 7 wherein:
a. said first material comprises a fluid; and
b. said second material comprises a dry composition in small particle form and substantially fills the area between said first and second tubular members.

9. Apparatus as defined in claim 8 wherein said powering means includes a resilient tubular sleeve means extending axially between said first and second axial end means.

10. Apparatus as defined in claim 8 wherein said resilient tensioning means includes a coil spring connected between said first and second end means.

11. Apparatus as defined in claim 8 wherein said resilient tensioning means includes a plurality of resilient connecting means extending between said first and second axial end means.

12. Apparatus as defined in claim 8 wherein said first material includes a fluid comprised primarily of mixed alophatic hydrocarbons and said second material comprises primarily small particles of ammonium nitrate.

13. Apparatus as defined in claim 2 wherein said mixing means includes a fluid conveying, perforated line extending between said end means.

14. Apparatus as defined in claim 8 further including a flexible, fluid conveying, perforated line connected with said outlet port means and extending between said end means for distributing the fluid contained in said cylinder through said small particle material.

15. Apparatus as defined in claim 8 wherein:
a. said first material comprises a non-explosive fluid, said second material comprises a non-explosive solid, and the mixture of said first and scond materials comprises an explosive combination; and
b. said second tubular member houses remotely operable detonator means for exploding said mixture.

16. Apparatus for compacting matter in an area having confining boundaries comprising:
a. first a second compacting means movable relative to each other to move said matter toward said confining boundaries whereby said matter is compacted;
b. controlled powering means for moving said first and second compacting means relative to each other;
c. two or more different, unmixed materials included in said matter; and
d. controlled mixing means connected with said compacting means and activated by said powering means for combining said different materials in said matter whereby said matter when compacted includes a mixture of said materials.

17. Apparatus as defined in claim 16 wherein said different materials are non-explosive until mixed.

18. Appartus as defined in claim 16 wherein said different materials include diesel fuel oil and ammonium nitrate.

19. Apparatus as defined in claim 16 wherein said powering means include releasable, tensioned, resilient means connected between said first and second compacting means and operable when released to move said compacting means relative to each other.

20. Apparatus as defined in claim 19 wherein said powering means include a resilient sleeve.

21. Apparatus as defined in claim 19 wherein said powering means includes a metal spring connected between said first and second compacting means and operable when released to move said compacting means relative to each other.

22. Apparatus as defined in claim 19 wherein said powering means includes a pluralty of resilient bands connected between said first and second compacting means and operable when released to move said compacting means relative to each other.

23. Apparatus as defined in claim 19 further including:
a. rigid, axially contractable support means extending axially between said first and second compacting means for preventing said resilient means from moving said first and second compacting means relatively toward each other; and
b. release means operable to permit said support means to axially contract whereby said compacting means may be moved to compact said matter.

24. Apparatus as defined in claim 23 further including a flexible, laterally expansible tubular housing extending about said support means and connected between said compacting means.

25. Apparatus for compacting matter in an area having confining boundaries comprising:
a. first and second compcting means movable relative to each other to move said matter toward said confining boundaries whereby said matter is compacted;
b. controlled powering means for moving said first and second compacting means relative to each other, said powering means including a releaable, tensioned, resilient metal spring connected between said first and second compacting means and operable when released to move said compacting means relative to each other;
c. two or more different, unmixed materials included in said matter; and
d. controlled mixing means connected with said compacting means for combining said different materials in said matter whereby said matter when compacted includes a mixture of said materials.

26. Apparatus for compacting matter in an area having confining boundaries comprising:
a. first and second compacting means movable relative to each other to move said matter toward said confining boundaries whereby said matter is compacted;
b. controlled powering means for moving said first and second compacting means relative to each other, said powering means including a plurality of releasable, tensioned, resilient bands connected between said first and second compacting means and operable when released to move said compacting means relative to each other;
c. two or more different, unmixed materials included in said matter; and
d. controlled mixing means connected with said compacting means for combining said different materials in said matter whereby said matter when compacted includes a mixture of said materials.

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