Sept. 6, 1938. J. E. SLUSSER 2,129,508

MOLDED EXPLOSIVE

Filed May 23, 1935

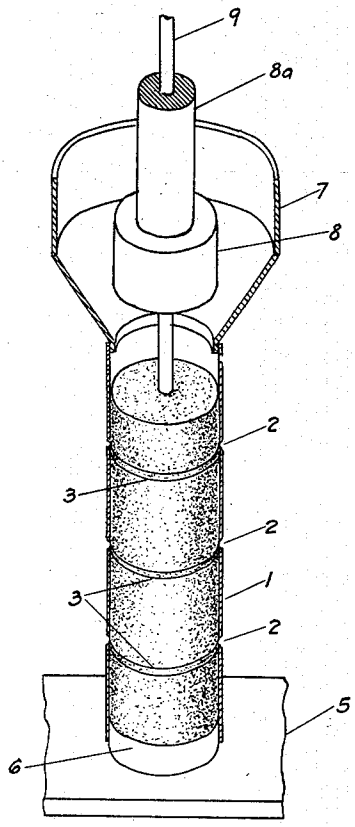


Fig. 1

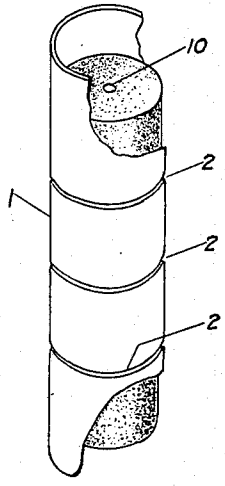


Fig. 2

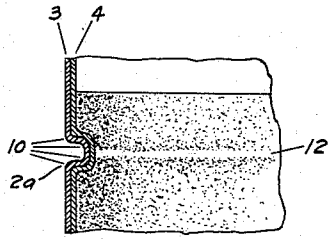


Fig. 3

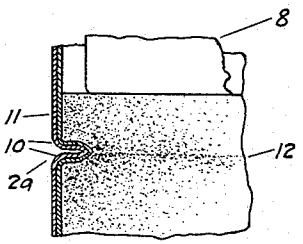


Fig. 4

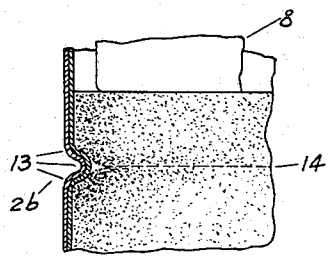


Fig. 5

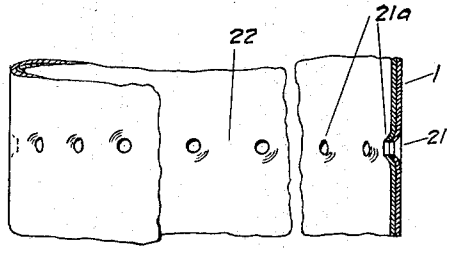


Fig. 7

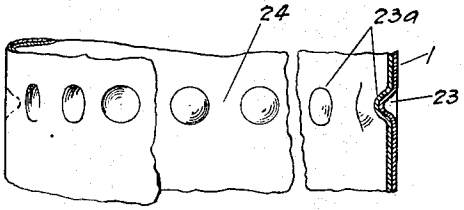


Fig. 8

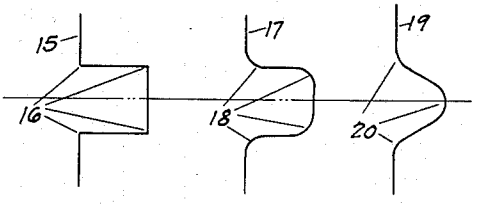


Fig 6a Fig. 6b Fig. 6c

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UNITED STATES PATENT OFFICE

2,129,508

MOLDED EXPLOSIVE

James E. Slusser, Suscon, Pa., assignor to Atlas Powder Company, Wilmington, Del., a corporation of Delaware

Application May 23, 1935, Serial No. 23,012

28 Claims. (Cl. 86—20)

My invention relates to improvements in molded explosives and in the method and means of manufacturing the molded explosives.

It is an object of my invention to produce a cartridge of explosive composition which may be easily divided into smaller units by the user if so desired, and to generally improve molded explosives similar to those disclosed in my prior Patent No. 1,913,344 of June 6, 1933.

It is another object of my invention to provide a method and means for manufacturing the improved cartridge.

It is still further an object of my invention to provide a convenient method and means for molding explosive compositions so that the manufacturer may easily vary the molded product from an integral, scored, monolithic stick of explosive composition to a scored mass of explosive composition in stick form but comprising separate sections having little or no cohesive strength at the scores.

Further objects of my invention will appear from the description hereinafter set forth and illustrated in the accompanying drawing, in which:—

Fig. 1 is a perspective view, partly in section, illustrating a step in the manufacture of cartridges according to my invention.

Fig. 2 is a perspective view partly cut away of the product after completion of the operation disclosed in Fig. 1.

Fig. 3 is an enlarged fragmentary view, partly in section, of one type of cartridge during one stage of the molding process.

Fig. 4 is a similar view during another stage of the molding process.

Fig. 5 is an enlarged fragmentary view, partly in section, of another type of cartridge during one stage of the molding process.

Figs. 6*a*, 6*b* and 6*c* shows diagrammatically various indentation outlines which may be employed in my improved cartridge molds.

Figs. 7 and 8 disclose two further modifications of my cartridge mold and are partly broken away to show the exterior and interior thereof.

In manufacturing explosives in accordance with the teachings of my prior Patent No. 1,913,344, it has been found that a substantially cylindrical cartridge of from 4 to 12 inches in length and having a length at least twice the diameter is most convenient to the average user of a cartridge. However, numerous instances arise where a particular shot requires a lesser amount of explosive than is contained in a cartridge of the size above referred to, and in such cases, the user of the cartridge cannot readily break off a cartridge into smaller units. The stick of molded explosive may be broken but it usually will break in the middle, leaving ragged, uneven ends. If it is further attempted to break the halves of the cartridge into even smaller sections, greater difficulty is experienced since the shorter length of the half is even harder to break and the half will probably be spoiled by the act of breaking it further. Moreover, if, for example, one-half of the cartridge is to be used in one shot and the following shot requires 1½ cartridges, the uneven end of the half used in the second shot may decidedly affect the ability of the cartridges to propagate one to the other if the uneven end is placed in contact with the complete stick for propagation purposes.

Since the cartridges disclosed in my prior patent have the explosive composition bonded to rigidity after the tamping operation, and since the mold in most instances becomes a part of the finished product, it has been difficult to provide a means whereby the user could easily break the cartridge into predetermined sections having even ends. My present invention, however, provides a body of molded powder having distinct zones of diminished strength whereby it may be easily separated into sections having ends which present substantially flat areas.

In producing an explosive in accordance with my invention, I preferably first form a substantially cylindrical, open ended envelope generally designated at 1 in the accompanying drawing. Envelope 1 has a normally plain surface but is provided with lines of indenture around its circumference, such as generally indicated at 2. In Figs. 1 and 2, these lines of indenture are shown in the form of grooves about the circumference of the cartridge, but I have found that the particular type of indenture affects the character of the resulting cartridge, as will hereinafter be more fully explained. The envelope shown is somewhat greater in length than the desired length of the finished cartridge, and is preferably formed of two thin layers of paper, as shown at 3 and 4 in the enlarged views of the cartridge. A coating of glue or other suitable adhesive material is applied between the paper layers 3 and 4 in the manufacture of the paper envelope. However, I do not limit myself to the use of two layers since a single shell of paper would fall within the scope of my invention.

The envelope so formed is mounted, as shown in Fig. 1, upon a suitable support 5 having

a cylindrical projection 6 dimensioned to fit neatly within the end of the envelope. In the upper end of the envelope 1, I insert the lower cylindrical end of a funnel-shaped hopper 7 adapted to receive the explosive composition to be tamped into the mold 1. A cylindrical plunger 8 has an axial passage for the rod 9 which extends longitudinally and centrally of the envelope 1 and acts as a guide for the plunger. Any suitable means such as the extension 8a may be provided for reciprocating the plunger within the envelope. Plunger 8 is slightly less in diameter than the envelope 1 and sufficient clearance is provided so that the grooves 2 will not interfere with the reciprocating action of the plunger. However, this clearance is very small for, until the tamped powder reaches a height above a groove, that particular groove is not forced into a position where its maximum projection into the interior of the mold is attained as will hereinafter more fully appear. After the tamped powder reaches the height of a groove, the plunger 8 no longer passes the groove in its reciprocation and the projection of the groove into the mold will not interfere therewith.

Except for the action of the lines of indenture 2, the process of forming the explosive cartridge is generally the same as that described in my prior patent. The hopper 7 is filled with explosive composition and when the plunger 8 is elevated to the position shown in Fig. 1, part of the explosive composition is permitted to pass downwardly into the envelope. The descent of the plunger 8 cuts off the passage of explosive composition and tamps and compacts the explosive composition previously passed into the mold. This operation is repeated until the envelope has received the required amount of explosive composition. The envelope and contained explosive composition are then removed and subjected to a drying operation, the ends of the envelope being open as shown in Fig. 2. The drying removes the moisture or other solvent from the explosive composition and leaves the latter in a hard, rigid condition and with substantial tensile strength. After drying, the open ends of the envelope may be suitably closed and sealed and the envelope thereby becomes a part of the finished cartridge. If desired, however, the molded explosive composition may be removed from the envelope. My prior Patent No. 1,913,344 contains a detailed description of the general process and product.

As previously indicated, the present invention involves the use of a paper envelope having lines of indenture such as grooves, or a series of indents or perforations thereupon. Fig. 3 is an enlarged view showing the cross-section of one type of groove generally indicated as 2a. This groove has relatively sharp corners as indicated at 10, and in the formation of the groove the paper envelope is substantially creased at these corners. Moreover, where two layers of paper are used, the groove may be formed immediately after the formation of the paper envelope and before the adhesive material between the two layers 3 and 4 is completely dry. As a result, the strength of the paper is materially weakened at the groove due to the disturbance of the adhesive material and the creases at the four corners 10.

In the operating steps, hereinafter set forth, certain theories to which the novel results may be attributed are included. The theoretical statements, however, are merely for the purpose of fully disclosing my invention in an analytical manner and of showing the theory that my observations have indicated to be true. If hereafter other theories are held to account for my results, I am not to be restricted because of theoretical statements herein, for by carrying out the steps recited the novel cartridges may be produced regardless of the exact theory as to what takes place within the mold or envelope.

When an envelope having grooves such as 2a is mounted as shown in Fig. 1, the tamping or compacting action is the same as in my prior patent until the compacted powder attains the height of the lowermost groove. The force exerted by the descending plunger acts upon the powder to compact the same, and the powder in compacting transmits the force from the plunger to the walls of the mold. The envelope walls therefore must be capable of exerting opposite and reacting forces to balance the light pressure exerted on the powder in the mold. The grooves 2a, however, have a lesser strength than the main body of the envelope, and when the compacted powder reaches and passes the lowermost groove, the pressure exerted by the plunger will tend to flex the groove into a position where it can maintain its share of the necessary reacting force.

Referring to Fig. 4 for illustration, the compacted powder is shown at a height slightly above the groove 2a and the plunger 8 as exerting a compacting force upon the powder. A part of this compacting force is transmitted radially to that portion of the envelope wall 11 which lies above the groove 2a. This force has a large downward component and the frictional engagement of the powder with envelope portion 11 transmits this downward component to the envelope. Since groove 2a lies below envelope portion 11 and since the groove has been weakened, it collapses as shown in Fig. 4, thereby disturbing and preventing the knitting or bonding of the powder particles in the zone surrounded by groove 2a.

When the plunger ascends in preparation for the succeeding stroke, the pressure on groove 2a is released and due to the inherent resiliency of the paper, it will return to its original shape as shown in Fig. 3. Hence the powder adjacent the groove 2a is subjected to the accordion-like action of the groove every time pressure is applied and released by plunger 8. When the powder is compacted to a height slightly above the second groove on the envelope, the accordion-like action takes place in both grooves. Similarly, when the compacted powder has reached the height shown in Fig. 1, all of the grooves are collapsed when the plunger descends.

My invention, therefore, allows the distribution of the tamping force over substantially the entire cross sectional area of the cylindrical mold by the large area of plunger 8 resulting in uniform density in the cartridge. However, after the initial tamping to the height of a groove a part of the tamping force is utilized to force the groove into the explosive composition as described above. This flexing of the envelope at the grooves prevents the explosive composition from knitting in the zones generally indicated at 12 in Figs. 3 and 4. During the drying operation the sections on each side of the zone 12 bond to rigidity, but there is substantially no cementing action between the two sections. After drying, the mass of explosive composition is found to consist of distinct and separate abutting sections.

The scoring produced by the projection of a groove such as 2a into the mass of explosive composition defines the peripheral edge of a clean

break neatly dividing the cylinder. When the envelope is retained as a part of the finished cartridge the grooves on the exterior thereof indicate where the cartridge may be easily divided. Since the envelope is weakest at the groove, the envelope may be broken cleanly at the plane where the sections of explosive composition abut each other. In my preferred embodiment I provide three grooves, as indicated in Fig. 1, whereby the explosive composition is divided into four sections. It is obvious, however, that one or any number of grooves may be used as desired.

In Fig. 5, I have shown a groove generally indicated at 2*b* having nicely rounded corners 13. Since the formation of these corners does not involve a creasing of the paper, the strength of the paper at the groove is materially greater than in a groove such as 2*a*. Hence, the collapse of the groove when plunger 8 is exerting pressure is materially reduced. However, there is always a slight tendency to collapse and groove 2*b* attains its maximum interior projection when plunger 8 is exerting pressure on explosive composition above the groove. This action produces a zone adjacent the groove of diminished cohesive strength, as indicated at 14. The finished cartridge in this instance, however, comprises an integral body and the sections defined by a groove 2*b* will not be separate, but are easily adapted to be separated by the user if so desired. Moreover, the groove produces a projection or ring on the interior of the mold which scores and reduces the cross-sectional area of the explosive composition, so that in addition to the decreased cohesive strength adjacent the groove, there is a zone of reduced area facilitating the breaking of the cartridge into sections. It is to be noted that the maximum projection of the groove occurs after the plunger ceases to reciprocate past the groove so that no interference takes place. Insofar as I am aware, I am the first to produce an integral molded stick of explosive composition having scores to facilitate breaking the stick into sections, and I consider this to be a broad aspect of my invention whether or not the explosive composition has a zone of diminished cohesive strength adjacent the score.

I have found that by varying the type of groove, various degrees of cohesive strength may be obtained in the areas enclosed by the groove. For example, in Figs. 6*a*, 6*b* and 6*c* I have shown three profiles, diagrammatically, of grooves which may be utilized to produce varying degrees of cohesive strength between the sections in the cartridge. The groove illustrated in Fig. 6*a* has a profile, generally indicated by 15 with a maximum degree of angularity; and the paper forming the envelope is creased at the points designated 16, materially reducing the strength of the envelope at these points. This produces a maximum collapse when the pluunger is in its tamping position, and the complete division of the powder at the jointure of the sections. The profile indicated at 17 in Fig. 6*b*, however, has the corners somewhat rounded, as indicated at 18, producing some reduction in the strength of the envelope at these points, but not to the extent of the reduction in strength as found in an envelope groove of profile 15. A cartridge provided with grooves having the profile 17 and molded as disclosed in Fig. 1 will have zones, bounded by the grooves, of slightly greater cohesive strength than the corresponding zones would have if the groove profile 15 were used. This is due to the fact that the paper envelope will not collapse to as great an extent as it would if the corners 18 of the groove were not nicely rounded. The profile indicated at 19 in Fig. 6*c* has the corners 20 even more nicely rounded so that the paper does not tend to crease or to decrease in strength at the points 20. A cartridge having grooves with a profile as disclosed at 19 will tend to collapse very little at the grooves, and consequently, although the powder is reduced somewhat in cohesive strength adjacent the grooves, a unitary stick of explosive will be molded in the envelope.

Hence, my invention enables the manufacturer to select a particular type of groove and to manufacture in the same apparatus either a plurality of sections of molded explosive composition or a single stick or cartridge which, however, has zones of diminished cohesive strength throughout its length. Regardless of the type selected, the cartridge may be cleanly broken into small sections if so desired.

In Fig. 7, I show another modification of the line of indenture that may be employed on the envelope wall. Perforations 21 pass through the paper envelope and project slightly into the interior of the mold as shown at 21*a*. These perforations weaken the envelope to some extent but since the spaces 22 between the perforations retain the original shape of the envelope, the accordion action of the envelope during the tamping operation is greatly diminished. Consequently, after drying the finished cartridge is an integral mass of explosive composition. The projections 21*a* score the molded explosive composition, however, and the cartridge may be broken at the line of indenture if so desired. By increasing or decreasing the number of perforations per inch on the envelope wall, the strength of the envelope at the line of indenture may be predetermined.

As shown in Fig. 8, the lines of indenture may comprise a series of indents 23 which do not, however, perforate the wall of the envelope. In this embodiment the paper is not broken at the indents 23 and the spaces 24 between the indents retain substantially the original contour of the envelope. Although the series of projections 23*a* breaks down the adhesive between the paper laminae and otherwise weakens the paper envelope along the line of indenture, the undisturbed portions 24 resist the tendency of the envelope to collapse due to force applied along lines parallel to the axis of the envelope. Consequently, when the explosive composition is tamped or compacted in the envelope, the accordion-like movement or flexing at the line of indenture is reduced to a minimum, and the finished product comprises an integral stick of explosive composition. The lines of indenture, however, define zones where the envelope is weak, the mass of explosive composition is scored, and where the explosive composition has a slight reduction in cohesive strength, all facilitating the clean separation of the cartridge into sections if so desired.

While I do not limit myself as to the particular manner of making the grooves on the paper envelopes, they may be easily provided thereon by simply mounting the tubes on a cylindrical mandrel having grooves thereon corresponding to the particular profile desired. Grooving wheels having a corresponding profile are then pressed against the envelope while the mandrel is rotated, the grooving wheels of course pressing

the paper envelope into the grooves on the mandrel. I have found that a mandrel groove of from 3/64 to 1/8 inch in width and approximately 3/64 inch in depth will produce a satisfactory line of indenture on a conventional 8 by 1¼ inch "Blakstix" envelope. However, this is not to be taken as limiting since the size of the groove may be varied within reasonable limits and the most desirable size depends somewhat upon the size of the envelope and the weight of the paper. If it is desired to perforate the envelope as shown in Fig. 7, the grooving wheel is merely provided at its periphery with a series of sharp points which will perforate the envelope as it is rotated on the mandrel. The series of indents as shown in Fig. 8 may be similarly formed, but in this instance the periphery of the grooving wheel is provided with a series of rounded projections so that the envelope will not be perforated.

Although I prefer to retain the envelope as a part of the finished product, it is obvious that my process may be applied to the manufacture of molded explosives even though the envelope is removed from the molded explosive after drying. For such purposes, any one of the types of grooves shown may be used, and if it is desired to manufacture a single stick of molded explosive having zones of diminished cohesive strength, the mold is provided with a groove as shown in Fig. 5, and upon subsequent removal of the mold, the sections of explosive composition will hold together until broken by the user thereof. However, if so desired, a groove similar to that disclosed in Figs. 3 and 4 may be used, and in one operation several sections of molded explosive composition may be formed. After drying, and upon removal of the mold or envelope 1, each section of explosive composition if unsupported will fall away from the adjacent section, as there is substantially no cohesion between the sections.

When the envelope is retained as a part of the finished product, it is frequently the practice to insert wads in the ends of the envelope and crimp the envelope over the wads to seal the explosive composition. I have found that cartridges having grooves as shown in Figs. 3 and 4 and having separate sections of explosive composition are particularly adapted to be handled in the machinery inserting these end wads. The machines usually insert wads simultaneously at each end of the cartridge, and heretofore the integral rigid sticks could not be perfectly aligned in the machine. Where the stick is divided into sections, however, it has a degree of flexibility which permits it to align itself perfectly for the reception of the wads.

The retention of the envelope, and the end closure of the same ensure a moisture-proof cartridge. Moreover, where a small section of the explosive is desired, the cartridge can be easily broken or divided by hand and it is unnecessary to unwrap or cut the envelope. As there is a definite cementing action between the explosive composition and the envelope, the envelope portion surrounding a particular section will be retained therewith and will protect the side walls of the section from moisture until firing occurs.

My invention is not limited to an explosive composition of any particular density or chemical composition. By "a molded mass" I mean generically the explosive composition molded in the envelope regardless of whether the cartridge comprises abutting sections or an integral stick of explosive composition.

I claim:

1. An explosive cartridge comprising molded explosive composition and at least a portion of the original mold, said mold portion comprising a substantially cylindrical envelope having at least one peripheral line of indenture spaced from the ends of the cartridge and along which the strength of the envelope is materially reduced, said line of indenture scoring the explosive composition molded therein and defining a zone of weakness where the cartridge may be easily broken into sections.

2. An explosive cartridge comprising molded explosive composition and at least a portion of the original mold, said mold portion comprising a substantially cylindrical envelope formed of at least two laminae of paper bonded together throughout substantially their entirety by adhesive material, and at least one peripheral line of indenture on the envelope along which the bond between the paper laminae is materially weakened, said line of indenture scoring the explosive composition molded therein and defining a zone of weakness where the cartridge may be easily broken into sections.

3. An explosive comprising a molded mass of explosive composition and at least a portion of the original mold, said portion of the original mold having at least one indenture thereupon, the molded mass of explosive composition having a substantial cohesive strength throughout the greater part of its length, and having a zone of lesser cohesive strength adjacent the indenture on the portion of the original mold.

4. An explosive comprising a substantially cylindrical molded mass of explosive composition and at least a portion of the original mold, said portion of the original mold having a normally plain exterior surface with at least one recess therein, the molded mass of explosive composition having a substantial cohesive strength throughout the greater part of its length, and having a zone of diminished cohesive strength adjacent the line of indenture in the surface of said mold.

5. An explosive cartridge having a principal axis and comprising molded explosive composition and at least a portion of the original mold, said molded explosive composition having substantial cohesive strength along the greater portion of the principal axis and at least one zone of diminished cohesive strength, said mold portion comprising a substantially cylindrical envelope having at least one peripheral line of indenture thereupon, said zone of diminished cohesive strength and said line of indenture being coincidently spaced from the ends of the principal axis whereby the cartridge may be grasped at the ends and broken at the line of indenture.

6. An explosive comprising a molded mass consisting of explosive composition having a principal axis, the length of which is at least twice the length of the smallest dimension of the mass, said mass having a substantial cohesive strength along the greater portion of the principal axis and having at least one zone of lesser cohesive strength between the ends thereof.

7. An explosive comprising a molded substantially cylindrical mass consisting of explosive composition having a principal axis, the length of which is at least twice the diameter of the mass, the cross-sectional areas of said mass lying in planes normal to the principal axis being substantially uniform along the greater portion of the principal axis, and at least one zone between the ends of the principal axis wherein said cross-sectional areas are reduced and wherein the co-

hesive strength of the explosive composition is lower than the cohesive strength of the explosive composition outside of said zone, the reduction in cross-sectional area and the low cohesive strength at the said zone facilitating the separation of the mass into sections.

8. An explosive in the form of a cartridge comprising a molded mass consisting of explosive composition having alternate zones of high and low cohesive strength.

9. An explosive cartridge comprising a substantially cylindrical molded mass of explosive composition having at least two substantially cylindrical sections of substantial cohesive strength separated by a relatively thin layer of explosive composition having lesser cohesive strength.

10. An explosive comprising a molded mass of explosive composition and at least a portion of the original mold having at least one indenture thereupon, the molded mass of explosive composition having a substantial cohesive strength throughout the greater part of its length and having a zone adjacent the indenture having a lower cohesive strength which is insufficient to prevent gravitational separation of the mass upon removal of the mold portion.

11. A substantially cylindrical explosive cartridge comprising molded explosive composition and at least a portion of the original mold enveloping said composition and adhering thereto, the exterior surface of said enveloping mold having at least one peripheral line of indenture and being otherwise substantially plain in character, the molded explosive composition consisting of at least two individual sections in abutting end to end relation, bounded at their adjacent ends by said peripheral line of indenture.

12. A cartridge as recited in claim 11 wherein the original mold portion is made of paper and the line of indenture comprises a groove having relatively sharp corners creasing the paper to weaken the same.

13. An explosive cartridge having a principal axis the length of which is at least twice the length of the smallest dimension of the cartridge and comprising individual sections of molded explosive composition arranged in abutting, end to end relation and at least a portion of the original mold forming a single container for the sections of explosive composition, said container being indented along at least one line forming the periphery of abutting ends of sections of explosive composition, the line of indenture indicating the location of the sections and facilitating the breaking of the cartridge into corresponding sections.

14. The method of molding explosive composition into a mass having at least two zones of substantial cohesive strength separated by a zone of explosive composition having lesser cohesive strength which comprises tamping the explosive composition into a first portion of a mold, and subsequently tamping additional explosive composition into a third portion of the mold, while flexing a second portion of the mold between the first and third portions.

15. The method as set forth in claim 14, wherein the flexing of the second portion of the mold results from the tamping of the explosive composition into the third portion of the mold.

16. The method of molding explosive composition into a mass, having at least two zones of substantial cohesive strength, separated by a zone of explosive composition having lesser cohesive strength, which comprises tamping the explosive composition into a first portion of a mold, and subsequently tamping additional explosive composition into a third portion of the mold, while flexing a second portion of the mold between the first and third portions, and then drying the molded mass of explosive composition.

17. A method of molding explosive composition which comprises tamping explosive composition in a first portion of a mold having substantial rigidity, tamping explosive composition in a second portion of the mold having a lesser, predetermined rigidity, and then tamping explosive composition into a third portion of the mold having substantial rigidity while exerting pressure on the second molded portion to flex the same.

18. The method of forming an explosive cartridge which comprises molding explosive composition by alternately admitting and tamping portions of explosive composition in a mold to build up a compacted mass of explosive composition, and projecting a portion of the mold interiorly of the mold beneath the level of the compacted mass to score the explosive composition therein.

19. The method of molding explosives which comprises massing explosive composition having at least one of the ingredients thereof partially dissolved in a solvent into substantially cylindrical form by alternately admitting and tamping portions of the explosive composition in a suitable mold while indenting the mass of explosive composition along at least one line about its circumference as it is formed in the mold, and subsequently removing at least a portion of the solvent to effect crystallization of the explosive composition and form a hard, substantially cylindrical, scored explosive mass.

20. The method of molding explosives which comprises alternately admitting and tamping portions of explosive composition in a mold to build up a compacted mass of explosive composition while repeatedly projecting a portion of the mold interiorly of the mold beneath the level of the compacted mass to disturb and prevent complete knitting of the particles of explosive composition in a zone adjacent said mold portion.

21. A mold for explosive composition comprising a paper envelope in substantially the form of a cylinder, said envelope being interiorly projected along a line about its circumference to form a zone of weakness where the envelope will tend to flex upon longitudinal compression.

22. A mold as recited in claim 21 wherein the interior projection comprises a groove having angular corners to crease and substantially weaken the mold at the groove.

23. A mold as in claim 21 wherein the interior projection comprises a groove having rounded corners to maintain substantially the full strength of the paper in the groove.

24. A mold as in claim 21 wherein the interior projection comprises a series of indents.

25. A mold as in claim 21 wherein the interior projection comprises a series of perforations.

26. A mold for explosive composition comprising a thin walled paper cylinder formed of at least two laminae of paper bonded together throughout substantially their entirety by adhesive material, said cylinder having at least one peripheral line of indenture along which the bond between the paper laminae is weakened.

27. A substantially cylindrical explosive cartridge comprising a molded mass of explosive composition having as an ingredient an inorganic salt, said mass of explosive composition

being bonded to rigidity by the cementing action of the inorganic salt ingredient, an envelope for said explosive composition having its exterior surface indented along at least one line about its circumference and remote from the ends of the cylindrical cartridge, said line of indenture defining a zone of weakness where the bonding effect due to the cementing action of the inorganic salt ingredient is diminished and where the cartridge may be broken into sections.

28. A substantially cylindrical explosive cartridge comprising a molded mass of explosive composition having as an ingredient an inorganic salt, an envelope for said explosive composition, said envelope being bonded to the explosive composition by the cementing action of the inorganic salt ingredient, the exterior surface of said envelope being indented along at least one line about its circumference and remote from the ends of the cylindrical cartridge, said line of indenture defining a zone of weakness where the bonding effect between the envelope and the explosive composition is diminished and where the cartridge may be broken into sections of explosive composition having individual envelope portions bonded thereto.

JAMES E. SLUSSER.

CERTIFICATE OF CORRECTION.

Patent No. 2,129,508. September 6, 1938.

JAMES E. SLUSSER.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 40, for "shows" read show; page 3, first column, line 62, for "pluunger" read plunger; page 4, second column, line 37, strike out the word "recess" and insert instead the words circumferential line of indenture scoring the molded mass of explosive composition; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 25th day of October, A. D. 1938.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents.