March 29, 1966 W. STEGBECK ETAL 3,242,862

METHOD OF AND APPARATUS FOR SWEEPING OF MINE FIELDS

Filed Feb. 23, 1961 3 Sheets-Sheet 1

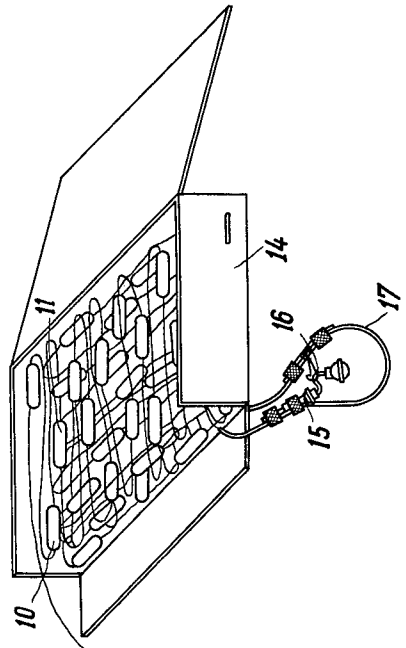
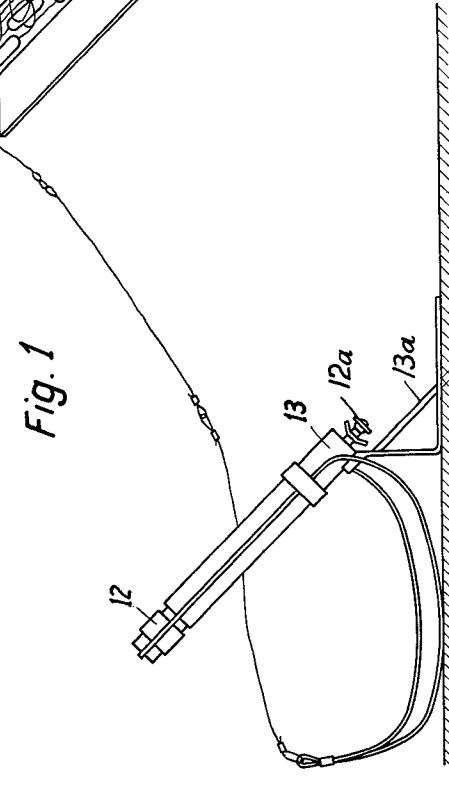


Fig. 1



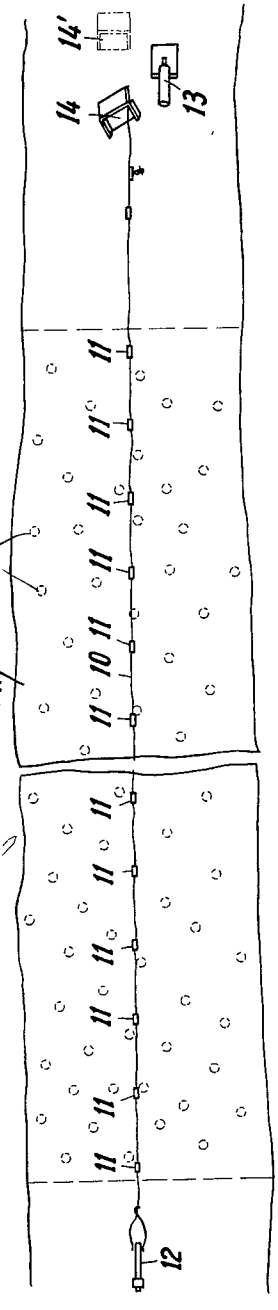


Fig. 2

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Filed Feb. 23, 1961 3 Sheets-Sheet 2

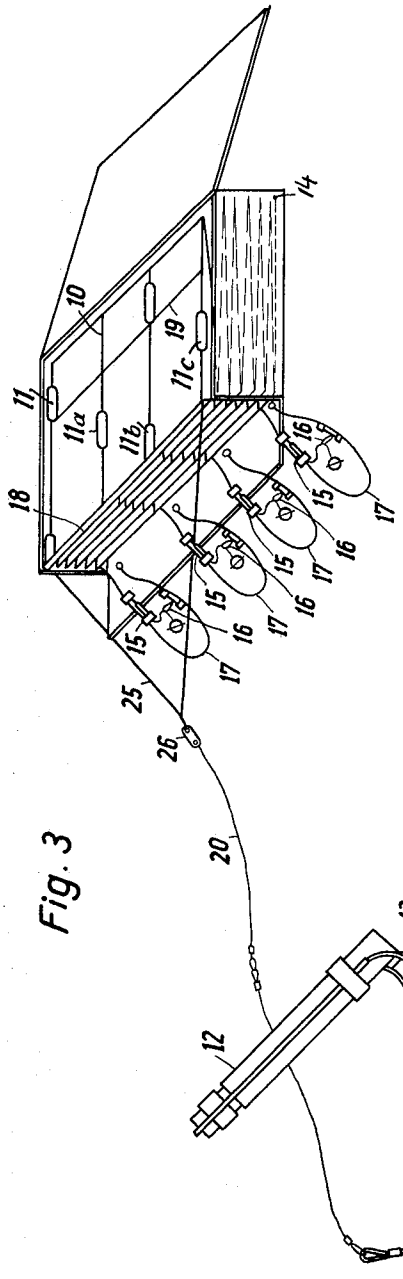


Fig. 3

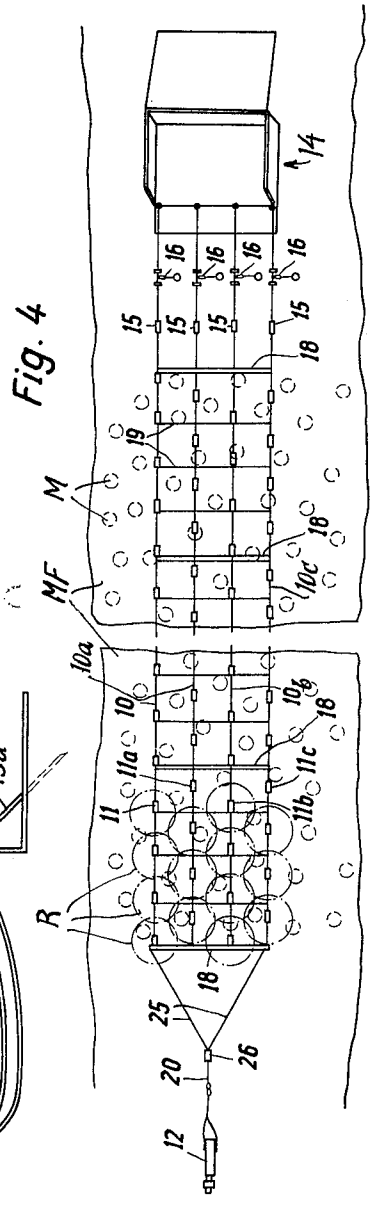


Fig. 4

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Filed Feb. 23, 1961 3 Sheets-Sheet 3

Fig. 5

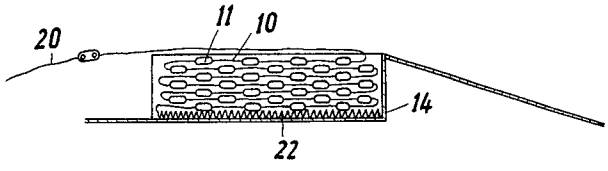


Fig. 6

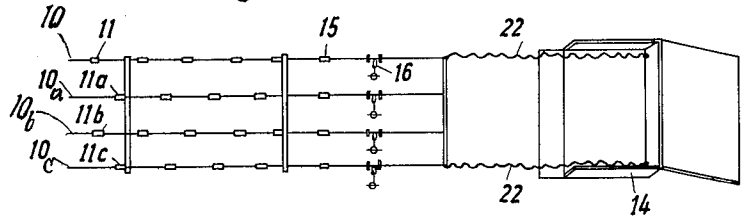
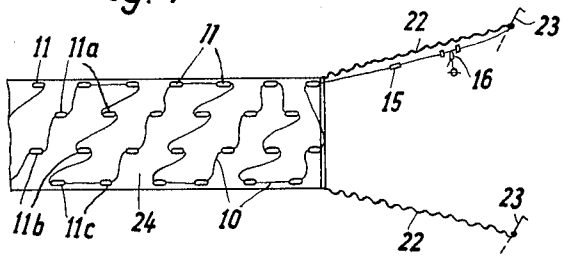


Fig. 7



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United States Patent Office 3,242,862 Patented Mar. 29, 1966

3,242,862

METHOD OF AND APPARATUS FOR SWEEPING OF MINE FIELDS

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Claims priority, application Germany, Dec. 5, 1960, C 20,169
18 Claims. (Cl. 102—22)

The present invention relates to a method of and to an apparatus for sweeping of mine fields, and more particularly to a method of and to an apparatus for clearing a path across a mine field.

An important object of the invention is to provide a method of sweeping a mine field which can be carried out without danger to the personnel in charge of the mine sweeping or clearing operation, which can be practiced for the clearing of a path across a wide or across a narrow mine field, and which may be resorted to for clearing a rather wide or a comparatively narrow path across a mine field.

Another object of the invention is to provide a method of the just outlined characteristics according to which the clearing of a path across a wider or narrower mine field may be completed in a single operation, and which may be carried out by a single person.

An additional object of the invention is to provide a method of and an apparatus for clearing a path across a mine field which may be resorted to in clearing of a field consisting of mines concealed in solid ground or of buoyant or ground mines which are submerged in water.

A further object of the instant invention is to provide a novel apparatus for the practice of the above outlined method, the apparatus being constructed and assembled in such a way that it may clear a path across the mine field in any desired direction, that the sweeping or clearing of the mine field may be carried out at a safe distance from the mines, and that the cleared path across the mine field is readily noticeable.

Still another object of the invention is to provide an apparatus of the above outlined characteristics which is readily and conveniently transferrable to a different locale, which occupies little room when not in actual use, and at least some parts of which may be put to renewed use.

With the above and certain other objects in view, the invention resides in the provision of a method of sweeping or clearing a mine field which comprises the steps of connecting a plurality of explosive charges with an elongated carrier preferably assuming the form of or comprising one or more flexible fuses so that the charges are arranged in at least one row extending substantially in the longitudinal direction of the carrier, launching one end of the carrier across the mine field so that the carrier entrains and deposits the row of charges on the mine field, and detonating the charges to thereby destroy the mines which are located within the range of the detonated charges.

The improved apparatus comprises at least one elongated flexible carrier which is connected with a plurality of preferably (but not necessarily) uniformly spaced explosive charges, launching means including a projectile (e.g. a rocket) connected with one end of the carrier and a catapult or gun for propelling the projectile from one side, across, and to the other side of the mine field so that the projectile entrains the row of charges and deposits the same on the mine field a a manner similar to that of shooting a life line in sea rescue operations, and means for detonating the row of charges after the charges are deposited on the mine field.

Since the carrier preferably assumes the form of or comprises one or more cord- or cable-like fuses, the charges may be detonated by an igniter at the other end of the fuse or fuses, and the igniting of the fuse or fuses may be carried out in a fully automatic way, e.g. by frictional heat, by concussion or percussion, by chemical or electrical action, or by a combination of two or more such actions. The ignition of the charges is delayed sufficiently to insure that the carrier is deposited on the mine field when the detonation takes place.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following detailed description of certain specific embodiments with reference to the accompanying drawings, in which:

FIG. 1 is a somewhat schematic perspective view of a mine sweeping apparatus embodying one form of our invention;

FIG. 2 is a schematic top plan view of a mine field and of the apparatus in operative position after the launching but prior to the detonation of the explosive charges;

FIG. 3 is a schematic perspective view of a slightly different mine sweeping apparatus;

FIG. 4 illustrates the apparatus of FIG. 3 in operative position with the carrier deposited on a mine field but prior to the detonation of its explosive charges;

FIG. 5 is a schematic section through a receptacle for a series of interconnected explosive charges;

FIG. 6 illustrates a portion of the apparatus of FIG. 5 in operative position prior to the detonation of explosive charges; and

FIG. 7 is a fragmentary top plan view of a different mine sweeping apparatus comprising a carrier one end of which is anchored in the ground.

Referring now in greater detail to the illustrated embodiments, and first to FIGS. 1 and 2, there is shown a mine sweeping or destroying apparatus which comprises a normally collapsed, extensible, elongated flexible carrier in the form of a cord-like fuse **10** connected with a plurality of suitable explosive charges **11** which, when the carrier is extended (see FIG. 2), form a row whose charges are but need not be uniformly spaced from each other and extend in the longitudinal direction of the carrier. The forward end of the carrier **10** is connectable with a projectile **12** of any known design, e.g. a suitable rocket comprising a solid or liquid propellent which may be ignited by a device **12***a*. The projectile **12** is placed onto a catapult device or gun **13** which is anchored in the ground by a stud **13***a* or the like. The projectile **12** and the catapult device **13** together form launching means for the carrier, and this launching means is utilized for shooting the forward end of the carrier across a mine field MF which consists of a large number of concealed mines M, whereby the carrier **10** entrains the row of explosive charges **11** and deposits the same on the mine field in the manner as shown in FIG. 2.

The rear end of the carrier **10** is connected with a receptacle in the form of a box **14** which is utilized as a means for storing the carrier during transportation to the locale of actual use and in which the carrier is preferably stored in such a manner as to be withdrawable in a fully automatic way when the projectile **12** is propelled in a flight path across the mine field MF. In addition, the box **14** serves as a brake or weight by insuring that the rear end of the carrier **10** remains at one side of the mine field while the forward end of the carrier lands at the other side of the field so that the row of charges **11** extends across and is deposited on the mine field. The

width of the mine field may reach or even exceed 80 meters.

The means for detonating the charges **11** is preferably operated in a fully automatic way and may comprise an assembly for igniting the rear end of the carrier **10** so that the carrier consecutively or simultaneously detonates the charges **11** and the exploding charges in turn destroy the mines M located within the range of the charges. In this manner, the charges may clear a foot path across a land mine field or a path in a water through which a boat may pass to break the blockade.

The detonating means shown in FIG. 1 comprises an igniter **15**, e.g. a friction tube, which is connected with and is located close to or at the rear end of the carrier **10**, and a lanyard **16** whose hook normally engages with the igniter to form in the carrier a loop **17**. The positioning, construction and operation of the detonating means **15, 16** are selected in such a way that the detonation of the charges **11** is delayed sufficiently so as to take place after the carrier **10** already extends across and is laid on the mine field MF. This insures that the charges are detonated when they are close to the concealed mines M. The ignition of the detonating means **15, 16** occurs automatically once the carrier is withdrawn from the box **14** and the projectile causes the hook of the lanyard to become separated from the friction tube **15**.

For example, the spacing between the individual charges **11** may equal the length of a step (e.g. 1 meter) so that a person may safely cross the mine field merely by stepping into the normally shallow holes formed in the ground by the exploding charges. As shown in FIG. 1, the carrier may be stored in its box **14** by folding it in zig-zag fashion, and the box may but need not assume the form of a comparatively heavy crate whose weight offers sufficient resistance to prevent the rear end of the carrier from being entrained onto or beyond the mine field. As shown in FIG. 2, the projectile **12** entrains the box **14** from the phantom-line position **14'** to the full-line position, i.e. the carrier **10** must be strong enough to withstand the stresses arising during the travel of the projectile across the mine field. The box **14** may be equipped with auxiliary weights or it may be replaced by a parachute. During the launching operation, the carrier **10** is stretched out while in the air and descends onto the field MF in fully extended position owing to the inertia of the weight attached to its rear end.

FIGS. 3 and 4 show a modified apparatus whose carrier consists of several cord-like fuses **10**, **10***a*, **10***b*, **10***c* which are parallel to each other and are respectively connected with explosive charges **11**, **11***a*, **11***b*, **11***c*. The fuses **10–10***c* are maintained in spaced relation by rigid distancing or spacer elements such as rods **18** made of wood or a synthetic plastic material, and are additionally connected to each other by transversely extending flexible elements **19**. The latter may consist of hemp or a like material. In their entirety, the fuses **10–10***c*, the rigid distancing elements **18**, and the flexible elements **19** form an elongated netting or flexible ladder for the four rows of spaced charges **11–11***c*. It will be noted that the charges in adjacent rows are preferably staggered with respect to each other so that their ranges (indicated by the phantom-line circles R) overlap which insures that all mines M of the field MF located below the out stretched carrier are destroyed when the charges **11–11***c* are detonated.

As shown in FIG. 3, the carrier may be stored in its receptacle **14** in a way to form an accordion-like structure which insures that it is automatically expanded when its forward end is connected to and entrained by the projectile **12**. The means for connecting the carrier with the projectile comprises a pair of flexible cables **25** which are secured to the foremost distancing element **18** and to a swivel **26**. The latter is connected with a flexible cable **20** whose forward end is fastened to the projectile **12**. The construction of the catapult device **13** and of

the detonating means **15, 16** for the individual fuses is the same as that described in connection with FIGS. 1 and 2.

The number of fuses in the apparatus of FIGS. 3 and 4 is selected with a view to clear across the mine field MF a path of predetermined width e.g. for a vehicle, for a watercraft, or for a column of troops. The box **14** again constitutes a weight or ballast which brakes the carrier and prevents the projectile **12** from entraining the rear end of the carrier onto or beyond the mine field.

Referring to FIGS. 5 and 6, there is shown that the rearmost distancing element **18** of the composite carrier for the rows **11–11***c* of explosive charges may be connected with non-elastic expandible members **22** which are secured to the receptacle **14**. For example, the members **22** may assume the form of non-elastic helically convoluted wires which may expand to a certain length but will not recoil even if the expanding force is reduced. Of course, if is equally possible to utilize slightly elastic springs or to replace the coiled members **22** by telescopically connected tubular members which produce a vacuum when moved in a direction away from each other. The members **22** perform a braking action in addition to or as a substitute for the receptacle **14**. As shown in FIG. 7, the free ends of the members **22** may be secured to stakes **23** which are driven into and are thus anchored in the ground; in such instances, the braking action is performed solely by the extendable members **22**. FIG. 7 also shows that the carrier for the explosive charges may comprise an elongated flexible band **24** and a cord-like fuse **10** which is secured to one side of the band **24** and is arranged in zig-zag fashion so that the explosive charges are again disposed in several substantially parallel rows and are staggered with respect to each other. An advantage of the apparatus shown in FIG. 7 is that it requires a single detonating means **15, 16** though its charges are arranged in several rows. The band **24** may consist of a textile material, a synthetic plastic netting or the like. The apparatus of FIG. 7 may be accommodated in a receptacle, such as the box **14** shown in FIG. 5, in a flexible bag, not shown, or in any other suitable container which is handy in transport and occupies little room when in storage. The band **24** may be folded in accordion fashion or it may be rolled into the form of a tube when the apparatus is not in actual use. The manner in which the front end of the band **24** may be secured to a projectile is usually the same as shown in FIGS. 3 and 4. The single detonating means **15, 16** ignites the fuse **10** when the extendable elements **22** are expanded sufficiently to permit a separation of the hook of the lanyard **16** from the friction tube **15**.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic and specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be protected by Letters Patent is:

1. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier comprising at least one cord-like fuse and having a forward end and a rear end, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended; a plurality of explosive charges connected with said fuse to form at least one row of charges extending in the longitudinal direction of said carrier between said ends thereof; launching means comprising a projectile adapted to be connected with the forward end of said carrier for shooting the forward end in a flight path across the mine field whereby the carrier

is extended and the row of charges is deposited on the field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and means provided at the rear end of said carrier for detonating the charges and for thereby destroying the mines located within the range of said row of charges whereby a path is cleared across the mine field, said detonating means comprising delayed ignition means for igniting said fuse with sufficient delay to detonate the charges after the charges come to rest on the mine field.

2. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier comprising at least one cord-like fuse and having a forward end and a rear end, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended; a plurality of explosive charges connected with said fuse to form at least one row of charges extending in the longitudinal direction of said carrier between said ends thereof; launching means comprising a projectile adapted to be connected with the forward end of said carrier for shooting the forward end in a flight path across the mine field whereby the carrier is extended and the row of charges is deposited on the field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and means provided at the rear end of said carrier for detonating the charges and for thereby destroying the mines located within the range of said row of charges whereby a path is cleared across the mine field, said detonating means comprising a friction tube connected with said fuse and a lanyard connected with said fuse and having hook means operatively engaging with said tube, said lanyard and said tube forming a loop in said fuse, said lanyard being separated from said tube and said tube igniting said fuse when the fuse is extended by said projectile so that the charges are detonated after they come to rest on the mine field.

3. An apparatus for sweeping a mine field which comprises, in combination, an elongated flexible carrier comprising at least one cord-like fuse and having a forward end and a rear end; a plurality of explosive charges connected with said fuse to form at least one row of charges extending in the longitudinal direction of said carrier between said ends thereof; launching means comprising a projectile adapted to be connected with the forward end of said carrier for shooting the carrier across the mine field whereby the row of charges is deposited on the field; means provided at the rear end of said carrier for detonating the charges and for thereby destroying the mines located within the range of said row of charges whereby a path is cleared across the mine field, said detonating means comprising delayed ignition means for igniting said fuse with sufficient delay to detonate the charges after the charges come to rest on the mine field; and a receptacle secured to the rear end of said carrier, said carrier and said charges adapted to be stored in said receptacle and said receptacle constituting ground contacting weight means and exerting a braking force for preventing the rear end of said carrier from being entrained onto and beyond the mine field during launching, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier and said receptacle may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier during launching.

4. An apparatus for sweeping a mine field which comprises, in combination, a receptacle; an elongated flexible carrier comprising at least one cord-like fuse and having a forward end and a rear end, said rear end being secured to said receptacle, said carrier being received in and arranged in zig-zag fashion in said receptacle so as to facilitate rapid and frictionless withdrawal of the carrier from the receptacle; a plurality of explosive charges secured to said fuse so as to form at least one row of charges extending in the longitudinal direction of the carrier between said ends thereof; detonating means operatively connected with said fuse; and launching means comprising a projectile adapted to be connected with the forward end of said carrier for shooting the carrier across and for depositing the carrier on the mine field, said detonating means adapted to detonate said charges so as to destroy the mines located in the range of said row of charges, said receptacle constituting ground contacting weight means for braking the rear end of said carrier so as to prevent the launching means from entraining the rear end onto and beyond the mine field, the braking force of said receptacle being weaker than the tensile strength of said carrier so that the receptacle may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of the carrier during launching.

5. An apparatus for sweeping a mine field which comprises, in combination, a receptacle; an elongated flexible carrier comprising at least one cord-like fuse and having a forward end and a rear end, said rear end being secured to said receptacle, said carrier being received in and folded in accordion fashion in said receptacle so as to facilitate rapid and frictionless withdrawal of the carrier from the receptacle; a plurality of explosive charges secured to said fuse so as to form at least one row of charges extending in the longitudinal direction of the carrier between said ends thereof; detonating means operatively connected with said fuse; and launching means comprising a projectile adapted to be connected with the forward end of said carrier for shooting the carrier across and for depositing the carrier on the mine field, said detonating means adapted to detonate said charges so as to destroy the mines located in the range of said row of charges, said receptacle constituting ground contacting weight means for braking the rear end of said carrier so as to prevent the launching means from entraining the rear end onto and beyond the mine field, the braking force of said receptacle being weaker than the tensile strength of said carrier so that the receptacle may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of the carrier during launching.

6. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier having a forward end and a rear end, said forward end being resepctively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended and comprising a plurality of substantially parallel cord-like fuses and distancing means for maintaining said fuses in spaced relation; a plurality of explosive charges connected with each of said fuses so as to form a plurality of rows of charges extending in the longitudinal direction of the carrier between said ends thereof; means adapted to be connected with the forward end of said carrier for launching the same in a flight path across the mine field whereby the carrier is extended and said rows of charges are deposited on

the mine field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and detonating means for exploding said charges whereby the charges destroy the mines located within the range of said row of charges.

7. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier having a forward end and a rear end, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended and comprising a plurality of substantially parallel cord-like fuses and rigid substantially rod-like transversely extending distancing means for maintaining said fuses in spaced relation; a plurality of explosive charges connected with each of said fuses so as to form a plurality of rows of charges extending in the longitudinal direction of the carrier between said ends thereof; means adapted to be connected with the forward end of said carrier for launching the same in a flight path across the mine field whereby the carrier is extended and said rows of charges are deposited on the mine field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and detonating means for exploding said charges whereby the charges destroy the mines located within the range of said rows of charges.

8. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier having a forward end and a rear end, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended and comprising a plurality of substantially parallel cord-like fuses and distancing means for maintaining said fuses in spaced relation; a plurality of explosive charges connected with each of said fuses so as to form a plurality of rows of charges extending in the longitudinal direction of the carrier between said ends thereof; means adapted to be connected with the forward end of said carrier for launching the same in a flight path across the mine field whereby said carrier is extended and said rows of charges are deposited on the mine field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and individual detonating means for each of said fuses for exploding the respective charges whereby the charges destroy the mines located within the range of said rows of charges.

9. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible

elongated flexible carrier consisting of a net-like structure comprising a plurality of cord-like fuses extending in the longitudinal direction of the carrier, a plurality of transversely extending flexible connecting elements secured to said fuses, and a plurality of transversely extending rigid distancing elements connected with and maintaining said fuses in spaced relation with respect to each other, said carrier having a forward end and a rear end, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended; a plurality of explosive charges connected with each of said fuses so as to form a plurality of rows of charges extending in the longitudinal direction of the carrier between said ends thereof; means adapted to be connected with the forward end of said carrier for launching the same in a flight path across the mine field whereby said carrier is extended and said rows of charges are deposited on the mine field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and detonating means provided at the rear end of said carrier for exploding said charges whereby the charges destroy the mines located within the range of said rows of charges.

10. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier having a forward end and a rear end and comprising a plurality of substantially parallel cord-like fuses and distancing means for maintaining said fuses in spaced relation, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended; a plurality of explosive charges connected with each of said fuses so as to form a plurality of staggered rows of charges extending in the longitudinal direction of the carrier between said ends thereof; means adapted to be connected with the forward end of said carrier for launching the same in a flight path across the mine field whereby said carrier is extended said rows of charges are deposited on the mine field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and detonating means for exploding said charges whereby the charges destroy the mines located within the range of said rows of charges.

11. An apparatus for sweeping a mine field which comprises, in combination, a carrier comprising an elongated flexible band and at least one fuse connected with said band, said carrier having a forward end and a rear end; a plurality of explosive charges connected with said fuse to form at least one row of charges extending in the longitudinal direction of the carrier between said ends thereof; means connectable with the forward end of said carrier for launching the same across and for depositing the charges on the mine field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force to and for preventing the rear end of said carrier from being entrained onto and beyond the mine field, said braking force

being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and means for detonating the charges whereby the charges desstroy the mines located in the range of said row of charges to clear a path across the mine field.

12. An apparatus for sweeping a mine field which comprises, in combination, a carrier comprising an elongated flexible band and a fuse connected in zig-zag fashion with said band, said carrier having a forward end and a rear end; a plurality of explosive charges connected with said fuse to form a plurality of rows of staggered charges extending in the longitudinal direction of the carrier between said ends thereof; means connectable with the forward end of said carrier for launching the same across and for depositing the charges on the mine field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force to and for preventing the rear end of said carrier from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and means for detonating the charges whereby the charges destroy the mines located in the range of said rows of charges to clear a path across the mine field.

13. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier having a forward end and a rear end, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended; a plurality of explosive charges connected with said carrier to form at least one row of charges extending in the longitudinal direction of the carrier between said ends thereof; launching means connectable with the forward end of said carrier for shooting the forward end in a flight path across the mine field whereby the carrier is extended and the row of charges is deposited on the field; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and means for detonating said charges and for thereby destroying the mines located within the range of said row of charges whereby a path is cleared across the mine field, the ranges of said charges overlapping each other.

14. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier having a forward end and a rear end said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended; a plurality of explosive charges connected with said carrier to form at least one row of charges extending in the longitudinal direction of the carrier between said ends thereof; launching means for shooting the forward end in a flight path across the mine field whereby the carrier is extended and the row of charges is deposited on the field; cable and swivel means for connecting the forward end of said carrier with said launching means; braking means constituting ground contacting weight means provided at the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier; and means for detonating said charges and for thereby destroying the mines located within the range of said row of charges whereby a path is cleared across the mine field.

15. An apparatus for sweeping a mine field which comprises, in combination, a normally collapsed extensible elongated flexible carrier having a forward end and a rear end, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended; a plurality of explosive charges connected with said carrier and forming at least one row of charges extending in the longitudinal direction of said carrier between said ends thereof; means connectable with the forward end of said carrier for shooting the forward end in a flight path across the mine field whereby the carrier is extended and the charges are deposited on the mine field; means for detonating the charges whereby the charges destroy the mines located within the range of said row of charges to clear a path across the mine field; and ground contacting weight means including extendable non-elastic means secured to the rear end of said carrier for applying a braking force to the same in response to contact with the ground as soon as the carrier is extended and is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that said non-elastic means may extend and said ground contacting weight means may be entrained a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier during launching.

16. An apparatus for sweeping a mine field which comprises, in combination, an elongated flexible carrier having a forward end and a rear end; a plurality of explosive charges connected with said carrier and forming at least one row of charges extending in the longitudinal direction of said carrier between said ends thereof; means connectable with the forward end of said carrier for shooting the carrier across and for depositing the charges on the mine field; means for detonating the charges whereby the charges destroy the mines located within the range of said row of charges to clear a path across the mine field; a receptacle for said carrier; and extendable non-elastic means secured to the rear end of said carrier and with said receptacle for braking the carrier during launching of the carrier across the mine field with a force which is weaker than the tensile strength of said carrier so that said non-elastic means may extend and that said receptacle may be moved a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier, said receptacle constituting ground contacting weight means.

17. In a method of sweeping a mine field with a plurality of explosive charges which are arranged in at least one row and which are provided on and distributed in the longitudinal direction of a normally collapsed extensible elongated carrier, the steps of launching one end of the carrier in a flight path from one side, across and to the other side of the mine field so that the carrier is extended and entrains and deposits the charges on the mine field; and as soon as the carrier is extended applying to the other end of the carrier a weight which in response to contact with the ground acts as a braking force strong enough to prevent the carrier from entraining all the chargse to the other side of the mine field and which is weaker than the tensile strength of the carrier and which maintains the other end of the carrier in close proximity with the ground, so that the other end of the carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of the carrier during launching.

18. An apparatus for sweeping a mine field, comprising a normally collapsed extensible elongated flexible carrier having a forward end and a rear end, said forward end being respectively nearer to and more distant from said rear end when the carrier is respectively collapsed and extended; an explosive charge connected with said carrier intermediate said ends thereof; launching means connectable with the forward end of said carrier for shooting the forward end in a flight path across the mine field whereby the carrier is extended and the charge is deposited on the field; means for detonating said charge and for thereby destroying the mines within the range of said charge whereby a path is cleared across the mine field; and braking means comprising ground-contacting weight means connected to the rear end of said carrier for applying a braking force thereto in response to contact with the ground as soon as the carrier is extended and the forward end is still in flight so as to prevent said rear end from being entrained onto and beyond the mine field, said braking force being weaker than the tensile strength of said carrier so that the rear end of said carrier may be entrained through a short distance along the ground rather than permitting excessive tensioning and eventual destruction of said carrier.

References Cited by the Examiner

UNITED STATES PATENTS

1,771,455	7/1930	Wiley	102—63
2,433,875	1/1948	Walker et al.	102—22
2,455,354	12/1948	Bisch	102—22
2,509,205	5/1950	Bisch	102—22
2,771,841	11/1956	De Fino	102—22
2,826,990	3/1958	Gross	102—8
2,925,038	2/1960	Walker	102—22
3,087,427	4/1963	Thorildsson	102—22

FOREIGN PATENTS

1,147,634	11/1957	France.
540,284	10/1941	Great Britain.

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