Oct. 11, 1966 J. W. RYAN 3,277,603

TOY DETONATING UNIT

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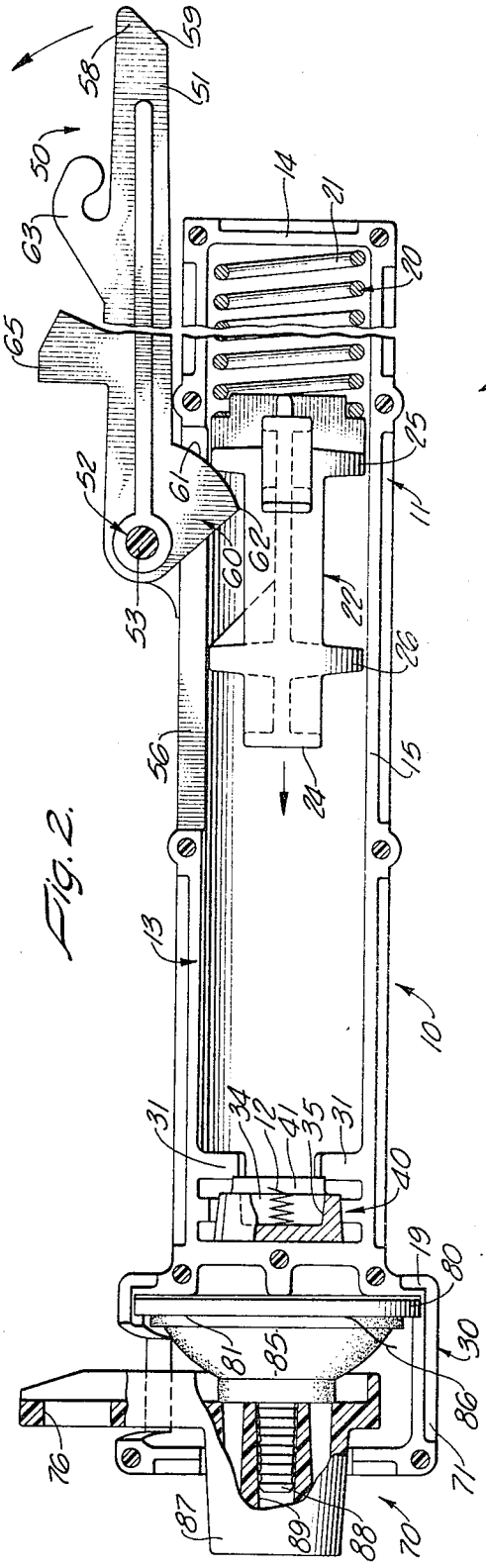


Fig. 2.

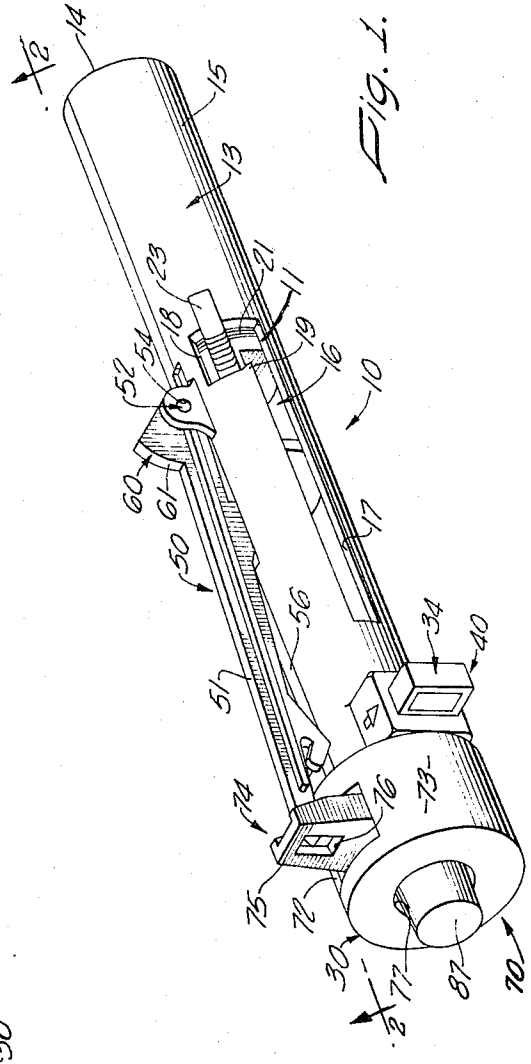


Fig. 1.

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Fig. 3.

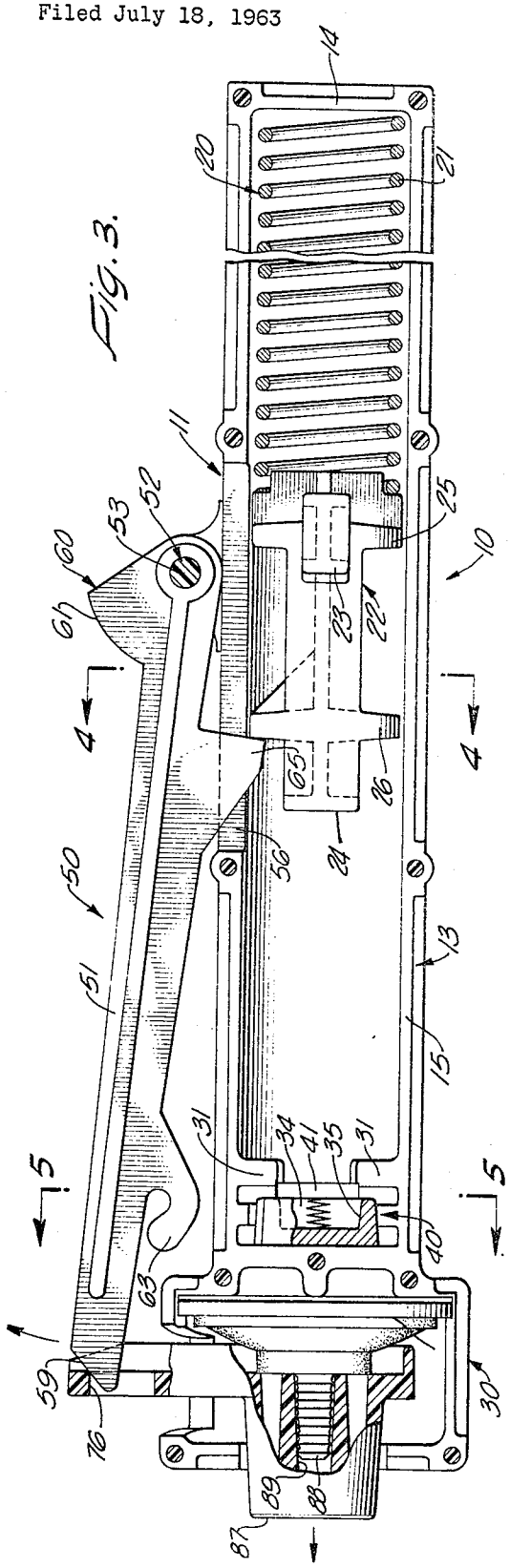


Fig. 4.

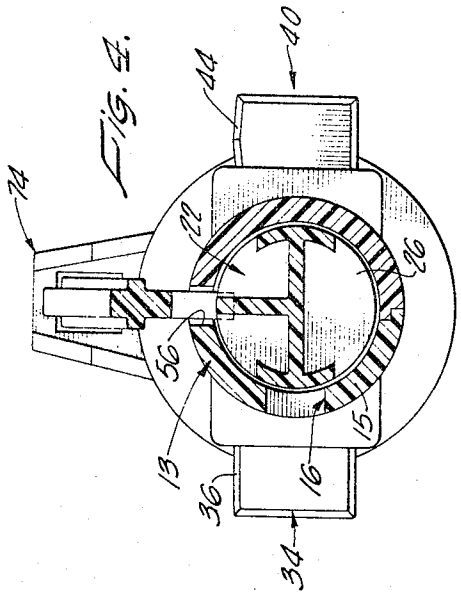
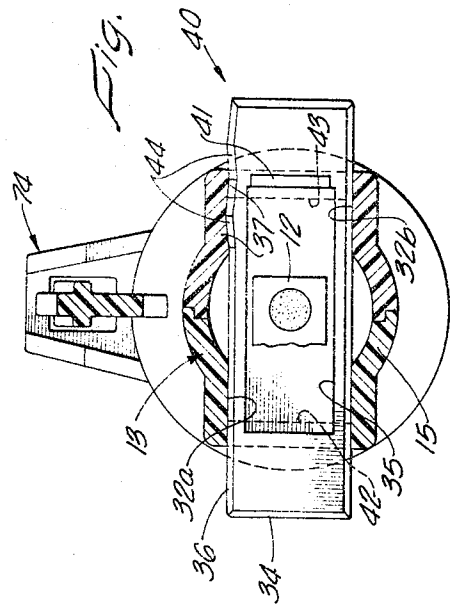


Fig. 5.



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3,277,603

TOY DETONATING UNIT

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Filed July 18, 1963, Ser. No. 295,923
10 Claims. (Cl. 46—196)

In general, the present invention relates to a simple, inexpensive toy detonating unit adapted to fire an explosive charge, such as a stack of caps. More particularly, the present invention relates to a toy detonating unit whose trigger means is adapted to operate either instantaneously or after a predetermined period of time.

There is known in the prior art a variety of devices for detonating explosive charges, such as caps. A common example of such devices is the usual cap gun. However, such prior art toy detonating units have been designed to operate in a very specific manner and such manner is usually the intentional operation of the device by the user of the device, e.g., pulling the trigger of the gun. Thus, such prior art devices are not adapted to operate in response to very slight forces on the trigger mechanism. For example, the prior art toy detonating units are usually not suitable for operation on an accidental basis, e.g., initiation of the operation by pulling of a trip wire.

In addition, the usual prior art toy detonating units normally have only one means for operating their trigger mechanism. Such means usually involve the direct operation of the trigger mechanism to cause the explosion by the detonating unit. Consequently, the trigger mechanisms of the prior art devices normally do not include a time delay mechanism. Furthermore, no prior art device has trigger means which can be operated either instantaneously or after a predetermined period of time.

In view of the foregoing state of the prior art, one of the objects of the present invention is a toy detonating unit which has trigger means operated either instantaneously or after a predetermined period of time.

Another object of the present invention is a toy detonating unit which has trigger means adapted to be operated by a very slight force being exerted thereon.

Another object of the present invention is a toy detonating unit having trigger means including a time delay release means incorporating a simple, rugged structure.

Still another object of the present invention is a toy detonating unit which is simple and inexpensive and adapted to be manufactured on a mass production basis.

Other objects and advantages of the present invention will be readily apparent from the following description and drawings which illustrate a preferred exemplary embodiment of the present invention.

In general, the present invention involves a toy detonating unit adapted to have its trigger means operated either instantaneously or after a predetermined period of time. Such toy detonating unit comprises a firing means for detonating an explosive charge by rapid movement from its retracted position to its extended position. Operatively associated with the firing means is a trigger means for initiating the operation of said firing means. The trigger means includes a lever pivotally mounted adjacent the firing means and having a first position adapted to maintain the firing means in a retracted position and to permit its instantaneous release therefrom. Also adjacent the firing means is a time delay release means which is adapted to hold the lever in a second position for a predetermined period of time. The lever in said second position is adapted to maintain the firing means in a retracted position when the lever is engaged with the time delay release means.

In order to facilitate understanding the present invention, reference will now be made to the appended drawings of a preferred specific embodiment of the present invention. Such drawings should not be construed as limiting the invention which is properly set forth in the appended claims.

In the drawings:

FIG. 1 is a perspective view of a preferred embodiment of the present invention showing the firing means in its retracted lock position.

FIG. 2 is a cross-sectional view of the toy detonating unit of FIG. 1 taken along the lines 2—2 of FIG. 1 showing the firing means in its retracted ready position and the lever portion of the trigger means in its first position.

FIG. 3 is a cross-sectional view of FIG. 1 taken along the lines 3—3 of FIG. 1 showing the firing means in its retracted ready position and the lever portion of the trigger means in its second position.

FIG. 4 is a cross-sectional view of FIG. 2 taken along the lines 4—4 of FIG. 2.

FIG. 5 is a cross-sectional view of FIG. 2 taken along the lines 5—5 of FIG. 2.

As illustrated in FIGS. 1–5, the toy detonating unit **10** of the present invention includes, generally, a firing means **11** and a trigger means **50**. The firing means **11** is adapted to detonate an explosive charge **12**, such as a stack of caps, by rapid movement from its retracted position to its extended position. The toy detonating unit **10** includes a cylindrical housing **13** with an end wall **14** at its first end. In the side wall **15** of the cylindrical housing **13** is an L-shaped slot **16** whose long leg **17** extends parallel to the axis of the housing **13** and whose short leg **18** extends perpendicular to the long leg **17** adjacent the end wall **14**. The short leg **18** of the slot **16** has a shoulder **19** which insures that the lug **23** does not accidentally slip out of the short leg **18** when positioned therein.

Enclosed in the housing **13** is the striking means **20** of the firing means **11**. Striking means **20** includes a helically coiled spring **21** braced against the end wall **14**. A hammer **22** is attached to the free end of the spring **21** and is slidably mounted in the housing **13**. The hammer **22** includes a lug **23** which extends outside the housing **13** and is slidably mounted in the L-shaped slot **16**. The hammer **22** also includes a hammer head **24** which is adapted to be received in a pocket **35** of the anvil **34** as set forth below. The lug **23** is adapted to maintain the proper orientation of the hammer head **24** with respect to the anvil pocket **35**. Thus, if the anvil pocket **35** and the hammer head **24** both have, for example, a rectangular shape as shown, then the lug **23** prevents circular rotation of the hammer head **24** when it approaches the anvil pocket **35** and insures that it is therein to explode the charge **12**. Along its length of the hammer **22** has a pair of spaced shoulders **25** and **26**. The first of the said shoulders **25** is more remote from the anvil **34** than the pivot connection **52** of the lever **51**, and the second shoulder **26** is closer to the anvil **34** than the lever pivot connection **52** when the firing means **11** is in its retracted position.

At the second end of the housing **13** is positioned the receiving means **30** which includes an opposing pair of spaced flanges **31** in the housing **13**, each having a port **32** therein. Slidably mounted in ports **32** perpendicular to the axis of the housing **13** is an anvil **34** having a pocket **35** adapted to receive the hammer head **24**. The width of the pocket **35** has substantially the same width as the caps being inserted therein. Thus the caps wedge into the anvil and are held there. In this way, a roll of caps can be folded into a stack and held as easily as a single cap. The receiving means **30** also includes stop means **40** adapted to permit the anvil **34** to slide out of the housing so that the pocket **35** may be loaded without becoming detached from the housing **13** and to permit the anvil **34**

to be positioned within the housing with the pocket **35** aligned with the hammer head **24**. The stop means **40** includes a lip **41** on the anvil **34** which strikes the edge **42** of the first port **32***a* to prevent the complete removal of the anvil **34** from the housing **13**. Similarly, the lip **41** strikes the edge **43** of the second port **32***b* to prevent insertion of the anvil **34** too far into the housing **13**. In addition, the anvil **34** has a spaced pair of mounds **44** projecting from its longitudinal side **36** which are adapted to receive the bosses **37** of the ports **32** therebetween. Such arrangement substantially locks the anvil **34** either into alignment with the hammer head **24** or in its extended position.

Operatively associated with the firing means **11** is a trigger means **50** for initiating the operation of said firing means. The trigger means **50** includes a lever **51** mounted adjacent the firing means **11** on the central portion of the housing **13** by means of a pivot connection **32**. The pivot connection **52** includes a pair of pins **53** extending from opposite sides of the lever **51** and rotatably mounted in holes **54** in a spaced pair of ears **55** extending from the side of the housing **13**. Extending longitudinally in the side wall **15** of the housing **13** between the ears **55** is a notch **56**. The notch **56** and the pivot connection **52** are positioned adjacent the striking means **20** of the firing means **11** when it is in its retracted position.

The lever **51** has a boss **60** thereon for maintaining the firing means **11** in its retracted position. When the lever **51** is adjacent the firing means **11**, a boss **60** engages the first shoulder **25** of the hammer **21** by insertion into notch **56**. In such position, the first shoulder **25** of the firing means **11** biases the lever **51** to move towards the firing means **11**, since the engagement of the shoulder **25** with the boss **60** tends to cause the lever **51** to rotate in a clockwise direction, as viewed in FIG. 2. However, preferably the boss **60** has a curved cam surface **61** against which the shoulder **25** rests when it is engaged with the boss **60**. Thus, rotation of the lever **51** in a counterclockwise direction is facilitated by the riding of the hammer shoulder **25** on the cam surface **61**. Furthermore, the lever **51** may be positioned in a range of positions whose limit is represented by the corner **62** of the boss **60**. Thus, the lever **51** may be positioned so that the hammer shoulder **25** rests adjacent the corner **62** and only a very slight force is required to move the lever **51** so that the hammer **22** slips past the boss **60**.

The lever **51** includes a pair of opposing ribs **57** along its length to increase its strength in rigidity. Furthermore, the lever **51** has a hook **63** adjacent its outer end which is adapted to facilitate the attachment of a string or wire to the lever **51**. Thus, when the lever **51** is in its first position, as illustrated in FIG. 2, a string may be attached to the hook **63** to permit the tripping of the trigger mechanism **50** by means of pulling such string.

The lever **51** also has a knob **65** thereon which is adapted to maintain the firing means **11** in its retracted position when the lever **51** is engaged with the time delay release means **70**. The knob **65** is adapted to be received in the notch **56** when the lever **51** is in its second position, as shown in FIG. 3. In such position, the knob **65** is engaged with the second shoulder **26** of the hammer **22** and is adapted to bias the lever **51** to rotate away from the firing means **11** in a clockwise direction.

Mounted adjacent the firing means **11** is a time delay release means **70** which is adapted to hold the lever **51** in its second position adjacent the firing means **11** for a predetermined period of time. The time delay release means **70** includes a cage **71** mounted on the second end **19** of the housing **13** adjacent the receiving means **30**. The cage **71** has an aperture **72** in its side wall **73** through which a latch means **74** extends. The latch means **74** includes an arm **75** with a bore **76** adjacent its free end. The bore **76** receives the free end **58** of the lever **51** when the lever **51** is engaged with the time delay release means **70**. Preferably, the free end **58** of the lever **51** has a cam surface **59** which engages the walls of the bore **76** and facilitates the disengagement of the lever **51** from the bore **76**. Furthermore, the reaction of the bore walls to the cam surface **59** of the lever **51** urges the arm **75** upwardly. Such action tends to shorten the period of time over which the time delay release operates.

Forming the wall of the cage **71** adjacent the housing **13** is a disk **80** having a smooth surface **81**. Loosely mounted within the cage **71** adjacent the disk **80** is a suction cup **85** which is adapted to be pressed into engagement with the smooth surface **81** of the disk **80** and to disengage slowly therefrom. Such disengagement is preferably achieved by means of a nylon thread **86** which extends from the interior of the cup to its exterior and is adapted to act as a controlled leakage of air into the suction cup. The leakage of air into the suction cup determines the period of time delay and can be controlled by the size and length of the thread **86** and, if necessary, additional threads may be utilized. Alternatively, the controlled leakage may be accomplished by means of a channel (not shown) in the surface **81** of the disk **80** which extends from the interior to the exterior of the suction cup **85**.

Attached to the top of the suction cup **85** is a cap **87** which extends through a second aperture **77** in the top of the cage **71**. The cap **87** is attached to the suction cup **85** preferably by means of fingers **88** extending upwardly from the suction cup **85** and engaged in recesses **89** in the cap **87**. Preferably, the fingers **88** have a plurality of ridges **90** thereon to insure engagement between the cap **87** and the suction cup **85**.

To operate the toy detonating unit **10**, the firing means **11** may be set in a locked retracted position, as illustrated in FIG. 1, by sliding the lug **22** along the long leg **17** of the L-slot **16** towards the first end wall **14** of the housing **13** and then wedging it by rotation into the short leg **18** of the L-slot **14**. Such retraction of the hammer **22** compresses the coiled spring **21** adjacent the first end wall **14** of the housing **13** and holds the hammer **22** relatively secure. If it is then desired to operate the firing means **11** by instantaneous operation of the trigger means **50**, the lever **51** may then be rotated into its first position, as illustrated in FIG. 2. In such position, after the lug **23** has been rotated back into the long leg **17** of the L-slot **16**, the boss **60** engages the first shoulder **25** of the hammer **22** and prevents the operation of the firing means **11**. Furthermore, the force exerted on the boss **60** by the hammer shoulder **25** tends to bias the lever **51** towards the firing means **11** so that the lever **51** remains adjacent to the firing means **11**. The lever **51** then may be rotated by an external force in a counterclockwise direction to initiate the operation of the firing means **11**. For example, a string may be attached to the hook **63** of the lever **51** and stretched across a walkway which is desired to be protected. The person walking along the walkway would then trip such string and initiate the operation of the firing means **11**. When the lever **51** is rotated counterclockwise, the shoulder **25** slips past the boss **60** and permits the hammer **22** to move rapidly from its retracted position to its extended position. The hammer head **24** is then received in the pocket **35** of the anvil **34** in the form of a sudden impact which detonates the explosive charge **12**.

After the explosive charge is detonated, the hammer **22** may then be retracted to its locked retracted position as set forth above. The anvil **34** may then be projected from the housing **13** by pushing on its end adjacent port **32***b* causing it to slide out the opposite port **32***a* while the stop means **40** prevents the anvil **34** from becoming detached from the housing **13**. In such projected position, the pocket **35** may be emptied and a new explosive charge **12** inserted. The anvil **34** may then be repositioned in the housing **13** with the pocket **35** aligned

with the axis of the housing 13 due to the stop means 40, as set forth above. Preferably, the anvil 34 has recesses 36 to facilitate grasping it during its charging operation.

Alternatively, if it is desired to initiate the operation of the firing means 11 after a predetermined period of time the knob 65 of the lever 51 is engaged with the second shoulder 26 of the hammer 22 after the lug 23 has been aligned in the long leg 17 in the L-slot 16. Simultaneously, the cap 87 is pressed so that the suction cup 85 engages the disk 80. Such engagement causes the bore 76 of the arm 75 to engage the free end 58 of the lever 51 and hold the lever 51 adjacent the firing means 11. The pressure on the cap 87 is then removed and the toy detonating unit is placed in its desired position. After the release of the pressure on the cap, air leaks into the suction cup 85 by means such as the thread 86 and such leakage gradually causes the suction cup 85 to disengage from the disk 80. Such disengagement in turn causes the cap 87 and the arm 75 mounted thereon to move away from the end of the housing 13 and thus permits the free end 58 of the lever 51 to slip out of the bore 76. Such disengagement is aided by the action of the cam surface 59 of the lever 51 on the arm 75, since the hammer 22 tends to cause the lever 51 to rotate in a clockwise direction and exert force on the arm 75. When the suction cup 85 disengages completely from the surface 80, the free end 58 of the lever 51 is released from the bore 76 in the arm 75 and the lever 51 is free to rotate in a clockwise direction. Such rotation permits the hammer 22 to move rapidly to its extended position and detonate the charge 12 in the anvil pocket 35.

Many other specific embodiments of the present invention will be obvious to one skilled in the art in view of this disclosure. For example, as set forth above, a variety of means may be utilized to permit the controlled leakage of air into a suction cup portion of the time delay release means. Similarly, the boss and knob on lever portion of the trigger means may be a single projection if a ball and socket connection is used to connect the lever to the housing to permit rotation of the lever about its axis.

There are many features in the present invention which clearly show the significant advance the present invention represents over the prior art. Consequently, only a few of the more outstanding features will be pointed out to illustrate the unexpected and unusual results attained by the present invention. One feature of the present invention is that the trigger means of the toy detonating unit is adapted to operate either instantaneously or after a predetermined period of time. Thus, the trigger means of the present invention can be pivoted to a first position wherein a boss holds the firing means in a retracted position and it may be pivoted into a second position wherein a knob holds the firing means in its retracted position. In such first position, the operation of the trigger means is initiated simply by causing rotation of the lever by such external forces as a trip wire. Alternatively, the operation of the trigger means in the second position is initiated by a time delay release means. Another feature of the present invention is that the operation of the trigger means in its first position may be initiated by a very slight force, since the engagement between the trigger means and the firing means is a cam surface which facilitates the release of the rotation of the operation of the firing means. Still another feature of the present invention is the utilization of a simple time delay release means whose time period is partially controlled by the force the firing means exerts on the trigger means.

It will be understood that the foregoing description and examples are only illustrative of the present invention and it is not intended that the invention be limited thereto. All substitutions, alterations and modifications of the present invention which come within the scope of the following claims or to which the present invention is readily susceptible without departing from the spirit and scope of this disclosure are considered part of the present invention.

I claim:

1. A simple, inexpensive, toy detonating unit adapted to have its trigger means operated either instantaneously or after a predetermined period of time, comprising:
   (a) movable firing means for detonating an explosive charge by rapid movement from a retracted position to an extended position; and
   (b) movable trigger means operatively associated with said firing means for releasing said firing means including
      (I) a lever pivotally mounted adjacent and movable relative to said firing means, said lever having means thereon for releasably engaging and holding said firing means in its retracted position when said lever is in a first position and to permit its instantaneous release therefrom upon movement of said lever and
      (II) a time delay release means mounted adjacent said firing means and adapted to hold said lever in a second position for a predetermined period of time and then release the same, the lever having further means thereon adapted to hold said firing means in its retracted position when said lever is in said second position and held therein by said time delay release means.

2. A toy detonating unit as stated in claim 1 wherein said firing means comprises:
   (a) a striking means including a hammer and spring, said spring biasing said hammer for rapid movement from said retracted position to said extended position; and
   (b) a receiving means including an anvil positioned to determine the extended position of said hammer and adapted to receive and position an explosive charge to be struck by said hammer at said extended position.

3. A simple, inexpensive toy detonating unit adapted to have its trigger means operated either instantaneously or after a predetermined period of time, comprising:
   (a) a firing means for detonating an explosive charge by rapid movement from its retracted position to an extended position, including
      (I) a hammer and spring, said spring being adapted to bias said hammer for rapid movement from said retracted position to said extended position and
      (II) an anvil positioned to determine the extended position of said hammer and adapted to receive and position an explosive charge to be struck by said hammer at said extended position;
   (b) trigger means operatively associated with said firing means for initiating the operation of said firing means, said trigger means including
      (I) a lever pivotally mounted adjacent said firing means, said lever having a boss thereon for maintaining said firing means in a retracted position when said lever is in a first position and permitting instantaneous release thereof upon movement of said lever, and
      (II) a time delay release means mounted adjacent said firing means and adapted to hold said lever in a second position for a predetermined period of time and then release the same, said lever having a knob thereon engaging and maintaining said firing means in its retracted position when said lever is held in said second position by said time delay release means.

4. A toy detonating unit as stated in claim 3 wherein said anvil has a pocket having a width such that when

an explosive charge of the same width is placed therein said explosive charge is wedged and held in position.

5. A simple inexpensive toy detonating unit comprising:

(a) movable firing means for detonating an explosive charge by rapid movement from a retracted position to an extended position; and

(b) movable trigger means for releasing said firing means comprising a lever pivotally mounted adjacent and movable relative to said firing means and having holding means thereon adapted to engage and hold said firing means in its retracted position and to permit its instantaneous release therefrom upon movement of said lever, said lever having two of said holding means thereon arranged so that said firing means may be retained in its retracted position with said lever in either of two positions, one of said holding means comprising a boss on said lever and so arranged that said firing means will bias said lever toward said firing means by engagement with said boss.

6. A toy detonating unit as stated in claim 5 wherein said firing means comprises:

(a) a striking means including a hammer and spring, said spring being adapted to bias said hammer for rapid movement from said retracted position to said extended position; and

(b) a receiving means including an anvil positioned to determine the extended position of said hammer and adapted to receive and position an explosive charge to be struck by said hammer at said extended position.

7. A simple, inexpensive, toy detonating unit adapted to have its trigger means operated either instantaneously or after a predetermined period of time, comprising:

(a) firing means for detonating an explosive charge by rapid movement from a retracted position to an extended position; and

(b) trigger means operatively associated with said firing means for initiating the operation of said firing means, said trigger means including

(I) a lever piovtally mounted adjacent said firing means, said lever having a first position in which it is adapted to maintain said firing means in its retracted position and to permit its instantaneous release therefrom upon movement of said lever,

(II) a time delay release means mounted adajcent said firing means and adapted to hold said lever in a lever in a second position for a predetermined period of time and then release the same, the lever in said second position being adapted to maintain said firing means in its retracted position when said lever is held by said time delay release means;

(c) a boss on said lever for maintaining said firing means in a retracted position when said lever is in its first position, said boss being adapted to bias said lever towards said firing means by engagement therewith; and

(d) a knob on said lever for maintaining said firing means in a retracted position when said lever is in its second position, said knob being adapted to bias said lever away from said firing means by engagement therewith.

8. A simple, inexpensive, toy detonating unit adapted to have its trigger means operated either instantaneously or after a predetermined period of time, comprising:

(a) firing means for detonating an explosive charge by rapid movement from a retracted position to an extended position; and

(b) trigger means operatively associated with said firing means for initiating the operation of said firing means, said trigger means including

(I) a lever pivotally mounted adjacent said firing means, said lever having a first position in which it is adapted to maintain said firing means in its retracted position and to permit its instantaneous release therefrom upon movement of said lever, and

(II) a time delay release means mounted adjacent said firing means and adapted to hold said lever in a second position for a predetermined period of time and then release the same, the lever in said second position being adapted to maintain said firing means in its retracted position when said lever is held by said time delay release means;

(c) said time delay means comprising a disk;

(d) a suction cup loosely mounted adjacent said disk, said suction cup being adapted to be pressed into engagement with said disk and disengaged slowly therefrom; and

(e) latch means connected to said suction cup, said latch means being adapted to hold said lever adjacent said firing means in said second position when said suction cup engages said disk and to release said lever when said suction cup disengages from said disk.

9. A simple, inexpensive toy detonating unit adapted to have its trigger means operated either instantaneously or after a predetermined period of time, comprising:

(a) a firing means for detonating an explosive charge by rapid movement from a retracted position to an extended position, including

(I) a hammer and spring, said spring being adapted to bias said hammer for rapid movement from said retracted position to said extended position, and

(II) an anvil positioned to determine the extended position of said hammer and adapted to receive and position an explosive charge to be struck by said hammer at said extended position;

(b) trigger means operatively associated with said firing means for initiating the operation of said firing means, said trigger means including

(I) a lever pivotally mounted adjacent said firing means, said lever having a boss thereon for maintaining said firing means in a retracted position and permitting instantaneous release therefrom upon movement of said lever when said lever is in a first position, and

(II) a time delay release means mounted adjacent said firing means and adapted to hold said lever in a second position for a predetermined period of time and then release the same, said lever having a knob thereon for maintaining in said second position of said lever said firing means in its retracted position when said lever is held by said time delay release means;

(c) said time delay release means comprising a disk;

(d) a suction cup loosely mounted adjacent said disk, said suction cup being adapted to be pressed into engagement with said disk and to disengage slowly therefrom; and

(e) latch means connected to said suction cup, said latch means being adapted to hold said lever adjacent said firing means in said second position when said suction cup engages said disk and to release said lever when said suction cup disengages from said disk.

10. A simple, inexpensive toy detonating unit adapted to have its trigger means operated either instantaneously or after a predetermined period of time, comprising:

(a) a firing means for detonating an explosive charge by rapid movement from a retracted position to an extended position, including

(I) a hammer and spring, said spring being adapted to bias said hammer for rapid movement from said retracted position to said extended position, and

(II) an anvil positioned to determine the extended

position of said hammer and adapted to receive and position an explosive charge to be struck by said hammer at said extended position;

(b) trigger means operatively associated with said firing means for initiating the operation of said firing means, said trigger means including

(I) a lever pivotally mounted adjacent said firing means, said lever having a boss thereon for maintaining said firing means in a retracted position and permitting instantaneous release thereof upon movement of said lever when said lever is in a first position, and

(II) a time delay release means mounted adjacent said firing means and adapted to hold said lever in a second position for a predetermined period of time and then release the same, said lever having a knob thereon for maintaining in said second position of said lever said firing means in its retracted position when said lever is held by said time delay release means;

said hammer having a spaced pair of shoulders along its length, the first of said shoulders being more remote from said anvil than the pivot connection of said lever adjacent said firing means and the second of said shouldrs being closer to said anvil than said pivot connection, said first shoulder being adapted to be engaged by said boss and said second shoulder being adapted to be engaged by said knob.

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