

Oct. 14, 1947.

W. F. SMITH

2,429,079

CONNECTING MEANS FOR EXPLOSIVE CARTRIDGES

Filed June 30, 1943

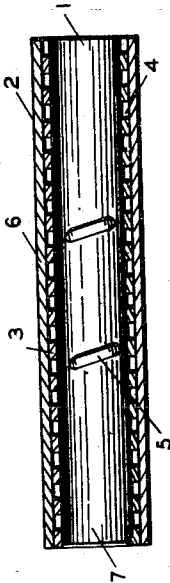


FIG. 1

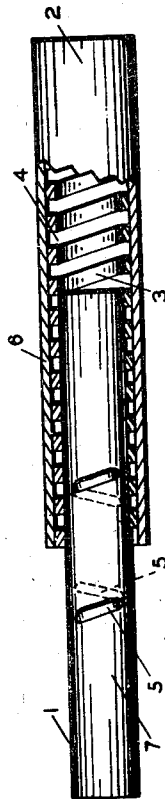


FIG. 2

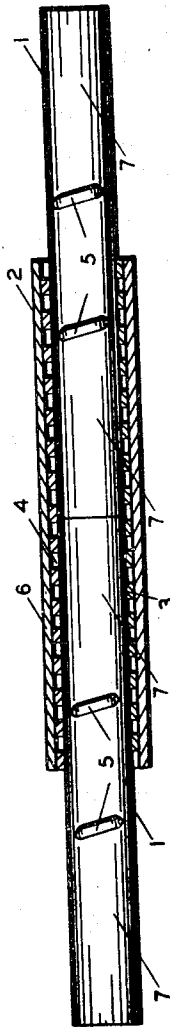


FIG. 3

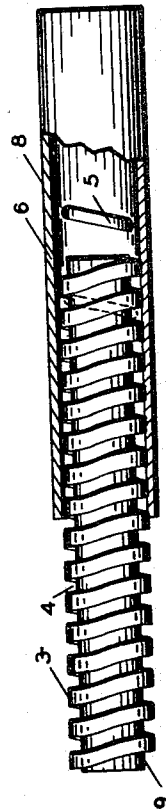


FIG. 4

INVENTOR.
WILLIAM FREDERICK SMITH

BY

Cleveland B. Holladay
ATTORNEY

UNITED STATES PATENT OFFICE

2,429,079

CONNECTING MEANS FOR EXPLOSIVE CARTRIDGES

William F. Smith, Wilmington, Del., assignor to
Hercules Powder Company, Wilmington, Del.,
a corporation of Delaware

Application June 30, 1943, Serial No. 492,816

3 Claims. (Cl. 102—24)

1

This invention relates to an improved explosive cartridge unit and more particularly to an explosive cartridge unit having means adapted to facilitate the assembly of a plurality of the units into a substantially rigid column of explosive.

In certain blasting work as, for example, in the seismograph blasting art, it is necessary to assemble a number of units of explosive in order to build up a charge sufficient in strength to serve the purpose for which it is to be employed. Many methods have been devised for accomplishing this assembly of units. Sleeves movable into frictional and telescopic engagement with adjacent pairs of cartridges have been used but the length of the assembly is limited by the holding power developed by any one sleeve through its frictional engagement with the cartridges. Spiral threads have been provided for effecting a threaded engagement between the cartridge and the sleeve. However, desirable features are still to be added under these conditions.

Therefore, it is an object of this invention to provide an explosive unit comprising a cartridge, a sleeve, and locking means carried by these parts for engagement with each other, one of the means being in the form of a thread and the other means being in the form of a lug.

Another object is to provide a rigid unitary assembly of explosive units held in position by means of sleeves which lock the cartridges in place by means of a thread carried by one part and lugs carried by the other part.

Still another object is to provide an explosive unit which may be assembled with other similar units in a facile, efficient, and economical manner.

In accordance with the present invention the objects of this invention are realized by providing an explosive unit comprising a cartridge filled with explosive and provided with lug elements distributed on the peripheral surface at a predetermined pitch, and a sleeve provided with threads disposed on the inner surface at the lug-element-pitch and movable throughout the length of the cartridge. A modification of the cartridge unit may comprise a sleeve which carries the lug elements on the inner surface thereof and a cartridge which carries the thread on the peripheral surface. Assembly of similar units is made by moving the sleeve of each unit to one end of the cartridge thereby exposing a substantial portion of the cartridge and then moving the exposed cartridge of one unit into lug and thread engagement with the extended end of the sleeve of another unit. Several units may be

2

joined in this manner to build up an explosive charge of any desired strength.

Having now indicated in a general way the nature and purpose of this invention, there follows a more detailed description of the preferred embodiments thereof, with reference to the accompanying drawing in which:

Fig. 1 is a part elevational and part sectional view showing the explosive unit in nested position;

Fig. 2 is a part elevational and part sectional view showing the parts of Fig. 1 in extended position ready for assembly with similar extended units;

Fig. 3 is a part elevational and part sectional view showing the cartridge of another unit in assembled relationship with the extended unit of Fig. 2;

Fig. 4 is a part elevational and part sectional view of a modified form of this invention.

Referring to the drawing and particularly Figs. 1, 2, and 3, numeral 1 indicates the cartridge and numeral 2, the sleeve of the explosive unit. These parts may be fabricated in any well known manner of any suitable material as, for example, paper, cardboard, metal, or plastic.

The sleeve 2 may be formed by feeding a thread-forming strip 3 onto a mandrel or other suitable support (not shown) at a predetermined pitch to form the continuous thread-like recess 4. The strip is of such width as to be wound in an open layer, the space or recess 4 between adjacent sides of the strip being of such width as to accommodate the thread-like lugs 5 carried by the cartridge 1. Another strip (not shown) is then fed over the thread-forming strip 3 to form a tubular casing 6 which acts as a support for the thread-forming strip 3. Adhesive is applied to the inner surface of the tubular casing-forming strip to effect a bond between the casing 6 and the strip 3. Winding, advancing, and cutting of the casing thus formed to a desired length forms the threaded sleeve 2 of the explosive unit.

The cartridge 1 is formed in a manner similar to the manner described with reference to the sleeve 2 except that the cartridge is formed from a conventional spiral wound tube which is made by feeding a tube-forming strip onto a mandrel (both not shown) of such a diameter as to permit a tube to be made which may be telescopically received within the sleeve 2. The lug elements 5 are applied to the peripheral surface of the tube at a pitch equal to the pitch of the thread-receiving recess 4. The lug elements may be fed onto the tube by means of a continuous

3

strip (not shown), carrying the elements toward the tube at the desired pitch. Pressure rolls (not shown) press the lugs into adhesive relationship with the tube. The lugs may also be carried at regularly spaced intervals by a strip of suitable pliable material (not shown) and fed onto the cartridge tube in such a way that both the lugs and the lug-carrying strip are pressed into adhesive relationship with the tube. The lugs may also be made integral with any suitable strip-like material and the strip and integral lugs applied as a single unit to the cartridge 1. In all cases, it is desirable to have the lugs positioned centrally of the finished cartridge after it has been cut free from the advancing tube as the tube is being formed on the mandrel (not shown). Winding, lugging, advancing, and cutting of the tube to a length preferably equal to the length of the sleeves forms the lugged cartridge of the explosive unit. It is desirable to have the lugs 5 distributed in pairs as shown, each lug of the pair being on opposite sides of the cartridge relative to each other and one pair being slightly toward one end away from the central portion of the cartridge and the other pair being slightly toward the other end away from the central portion of the cartridge. In this manner, one pair of lugs acts to engage with one sleeve and the other pair of lugs acts to engage with an adjacent sleeve. The cartridge is then crimped at one end in a conventional manner, filled with explosive and then closed at the other end by similar crimping.

The lugs are preferably positioned on the cartridge at a relatively low pitch, in the order of about 26 to about 30°. A lug and thread pitch of this relative value prevents separation of the cartridges when high tensile stresses are set up in an assembly of a relatively large number of these units because the lugs and thread are in a substantially shear relationship to each other. The high pitch relationship of the thread and thread methods of the prior art must depend on the friction exerted between the thread surfaces. The degree of friction that may be developed determines the limit to which the column of explosive may be built. On the other hand, the use of the lug and thread combination of this invention retains the advantages of high speed thread pitches and at the same time eliminates their disadvantages.

Further advantages are to be realized when constructing the cartridge in the manner just described. For example, assembly of the cartridge with the sleeve is facilitated because of the free unplugged end portions 7 which may be quickly moved into telescopic relationship with either end of the sleeve 2. The cartridge and sleeve are then locked together by a simple, quick, twist of both the cartridge and the sleeve in opposite directions relative to each other. This twisting action moves one pair of the lugs 5 into thread locking engagement with the thread 4 as shown by Fig. 2. The cartridge may be quickly moved to coextensive relationship with the sleeve when a minimum volume explosive unit is desired for purposes of packing for shipment to the field. Once received in the field, operators may quickly extend the sleeve of a number of the explosive units to the position shown by Fig. 2, and then interconnect an exposed cartridge and its free pair of lugs of one unit with the extended portion of a sleeve of another unit to form a rigid column of explosive shown being built up in Fig. 3.

In building up a rigid column of explosive in

4

accordance with the present invention, it is desirable to have the sleeves in end-to-end abutting relationship to each other to form a substantially continuous tubular reinforcing and joining member for the column of explosive cartridges. This end-to-end abutting relationship is facilitated when the length of the cartridge is approximately equal to the length of the sleeve. By providing this substantially continuous tubular reinforcing and joining member for the cartridges a continuous and smooth outer surface is provided for the column which facilitates positioning of the column into a borehole which borehole may not be free of obstructions such as extending ledges of rock, etc.

A modification of this invention is shown in Fig. 4 where the sleeve 8 carries the lug 5 and the cartridge 9 carries the thread-forming strip 3. The parts are made and assembled in a manner similar to the manner described with respect to Figs. 1 through 3, except that in making the cartridge 9 the thread-forming strip 3 is fed onto a tube in adhesive relationship thereto to form the thread receiving recess 4. The sleeve is made by feeding a lug bearing strip similar to those described with respect to the cartridge 1 onto a suitable mandrel (not shown), followed next by a casing-forming strip which forms the casing 6 in adhesive relationship with the lugs 5. The lugs 5 are preferably spaced in pairs opposing each other on either side of the central portion thereof in the manner described with respect to the cartridge 1.

A further modification may be realized by omitting the thread-forming strip 3 from the medial portion of the sleeve 2 shown in Figs. 1 through 3. In this manner, only the end portion of the sleeve will be provided with a thread for engagement with the lugs 5 when assembling a number of the units. This arrangement of spaced thread sections may also be applied to the cartridge 9 of Fig. 4. In this way, assembly of the parts into a nested unit and assembly of the units into a rigid column of explosive is further facilitated.

The sleeve and cartridge of the explosive unit may be molded from a suitable synthetic plastic as, for example, any of the well known thermosetting and thermoplastic resins whereby the thread and lugs may be cast as an integral part of the cartridge and thread.

From the foregoing description, it is apparent that the objects of this invention have been accomplished by providing an explosive unit comprising a sleeve, a cartridge, and locking means carried by these parts in engagement with each other, one of the means being in the form of a thread and the other means being in the form of a lug and adapted to be assembled with similar units to provide a rigid column of explosive free of the disadvantages to be found in units not embodying the advantages of this invention.

What I claim and desire to protect by Letters Patent is:

1. An explosive device adapted for attachment to a similar explosive device comprising a cartridge; a sleeve of substantially the same length as the cartridge and coextensive therewith; and locking means carried by the cartridge and the sleeve, one of said locking means being in the form of a thread and the other of said locking means being in the form of two sets of lug elements for locking engagement with said thread, one set of lug elements being positioned in the central portion of the device and slightly toward one end away from the center and the other set

5

of lug elements being positioned in said central portion and slightly toward the other end away from said center, whereby when the cartridge and sleeve of the device are halfway unthreaded for attachment of a similar device one set of lug elements remains in locking engagement with said thread and the other set of lug elements is adapted to engage the thread of said similar device.

2. An explosive device adapted for attachment to a similar explosive device comprising a cartridge having two sets of lug elements carried on the exterior thereof, one set of lug elements being positioned in the central portion of the cartridge and slightly toward one end away from the center, and the other set of lug elements being positioned in said central portion and slightly toward the other end away from said center; and a sleeve of substantially the same length as the cartridge and coextensive therewith having a continuous thread on the interior thereof in threaded engagement with the lug elements, whereby when the cartridge and sleeve of the device are halfway unthreaded for attachment of a similar device one set of lug elements remains in locking engagement with said thread and the other set of lug elements is adapted to engage the thread of said similar device.

3. An explosive device adapted for attachment

6

to a similar explosive device comprising a cartridge having a thread on the exterior thereof; and a sleeve of substantially the same length as the cartridge and coextensive therewith having two sets of lug elements carried on the interior thereof in threaded engagement with the cartridge thread, one set of lug elements being positioned in the central portion of the sleeve and slightly toward one end away from the center, and the other set of lug elements being positioned in said central portion and slightly toward the other end away from said center, whereby when the cartridge and sleeve of the device are halfway unthreaded for attachment of a similar device one set of lug elements remains in locking engagement with said thread and the other set of lug elements is adapted to engage the thread of said similar device.

WILLIAM F. SMITH.

REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
2,317,354	Bennett	Apr. 27, 1943
1,203,546	Parsons	Oct. 31, 1916
2,413,862	Cohan	Jan. 7, 1947