July 4, 1939. F. STRUZIK 2,164,690

PLUG INSERT FOR BORE HOLES FOR CUSHION BLASTING IN GASEOUS MINES

Filed April 30, 1937 2 Sheets-Sheet 1

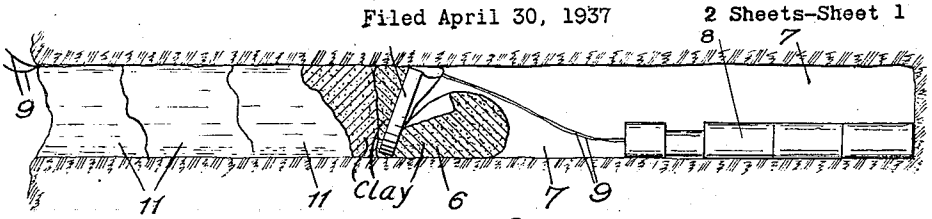


Fig. 1.

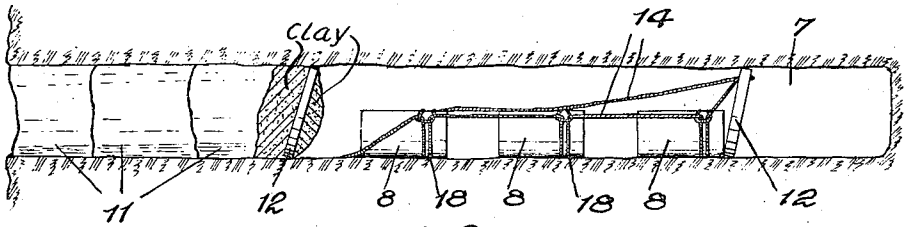


Fig. 2



Fig. 3.

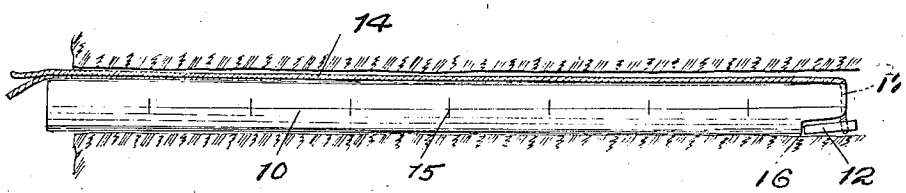


Fig. 4.

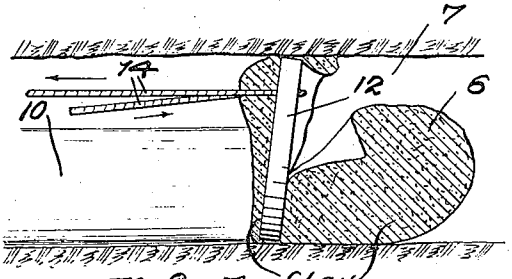


Fig. 5.

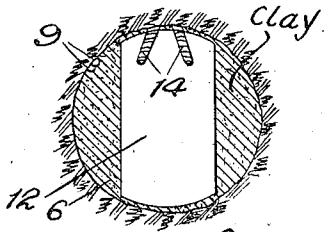


Fig. 6.

INVENTOR,
F. Struzik
By: Glascock Downing & Seebold
Attys.

July 4, 1939. F. STRUZIK 2,164,690

PLUG INSERT FOR BORE HOLES FOR CUSHION BLASTING IN GASEOUS MINES

Filed April 30, 1937 2 Sheets-Sheet 2

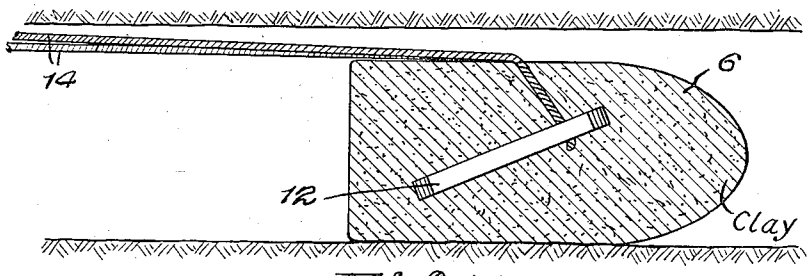


Fig. 7.

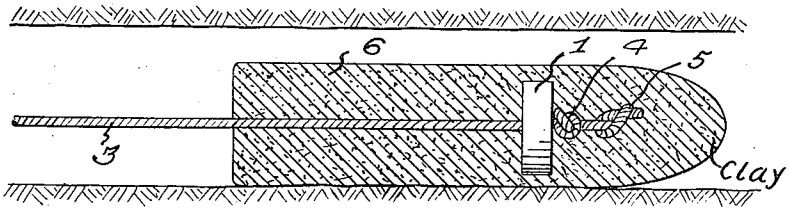


Fig. 8.

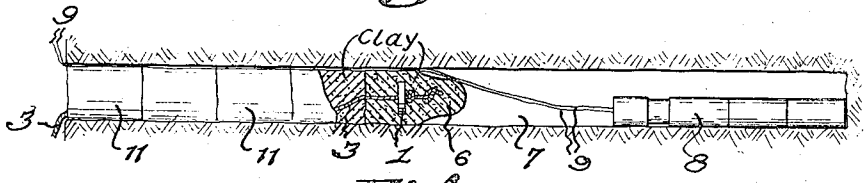


Fig. 9.

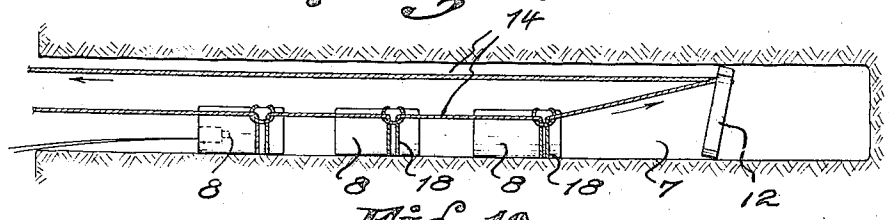


Fig. 10.

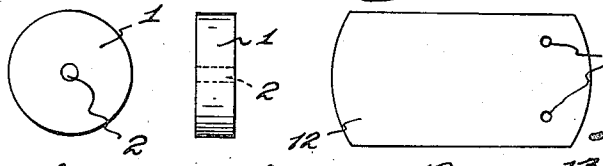


Fig. 11. Fig. 12. Fig. 13.

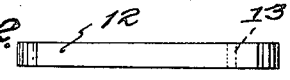


Fig. 14.

F. Struzik
INVENTOR

By: Glascock Downing & Seebold
Attys.

Patented July 4, 1939

2,164,690

UNITED STATES PATENT OFFICE

2,164,690

PLUG INSERT FOR BORE HOLES FOR CUSHION BLASTING IN GASEOUS MINES

František Stružik, Petrvald, Czechoslovakia, assignor of one-third to Josef Dvorak, Moravska Ostrava-Vitkovice, Chodska, Czechoslovakia, and one-third to Karel Pokorny, Moravska Ostrava-Zabreh, Moravska, Czechoslovakia

Application April 30, 1937, Serial No. 140,044
In Czechoslovakia May 4, 1936

6 Claims. (Cl. 102—11)

According to the safety regulations of mines-offices with regard to cushion shots in mines with fire damp, the use of incombustible material as inserts for filling the spaces before and behind the charge in the shot hole is permitted. These inserts—so called spare cartridges—consist of hollow cylinders made of pasteboard, inserts of cross framed sections, ribs of wires, etc., by which the connection to the outside of the bore-hole is kept open for the isolated electric wire. The shot hole fully charged and provided with spare cartridges is stemmed with clay.

All disadvantages of prior blasting means are eliminated by the use of plug inserts according to my invention which consists of inserting and packing the plug inserts which are made of incombustible material, in soft clay plugs or clay bells which on being inserted into the bore holes do not cause any ignition friction nor do any damage to the insulated wiring so that the plugs are absolutely safe and reliable and moreover very simple.

The accompanying drawings show the constructional form of my invention.

Fig. 1 is a longitudinal section of the shot hole including the charge when using clay plugs with disc inserts;

Fig. 2 shows a modification in which a disc insert is wedged in the bore hole to form a sustaining means for the explosive charge;

Fig. 3 shows the means employed for wedging the flat disc insert in a bore hole;

Fig. 4 shows the means for introducing a flat insert to the required depth by means of a ramming member;

Fig. 5 is a longitudinal section showing the insertion of a plug in a shot hole by the wedging action of the flat insert;

Fig. 6 is a sectional view of plug shown in Fig 5;

Fig. 7 is a longitudinal section of a plug of soft clay with disc insert;

Fig. 8 is a longitudinal section of a soft clay plug with round plugs in position;

Fig. 9 is a vertical section of the entire shot hole including the charge when using clay plugs with round inserts;

Fig. 10 shows the means for inserting the explosive charge to be supported on a wedged flat insert;

Fig. 11 is a front view of a round plug insert;

Fig. 12 is a side view of the same;

Fig. 13 is a front view of the disc shaped plug insert, and

Fig. 14 is a side view of the same.

The round plug insertion according to my invention consists of a flat incombustible disc 1 of asbestos or similar material having a hole 2 in the middle through which an incombustible cord 3 can be drawn. The end of the cord 3 drawn through insertion 1 is provided with knots 4 and 5 to prevent slipping through hole 2. The entire insertion 1 together with the knotted end of cord 3 is inserted and packed in a corresponding piece of soft clay or earthenware which is then formed in a plug 6.

The cord 3 and the second knot 5 and the part of the cord end between the knots 4 and 5 constitute a valuable stiffening of the clayplugs. Should a thick layer of soft clay of the same diameter as plug 6 be required around insertion 1, insertion 1 is then inserted diagonally into plug 6. The soft plug 6 prepared in the above manner together with insertion 1 is then plugged to a certain depth in the shot hole which is provided with charge 8 and conducting wires 9—Fig. 9. Plug 6 and insertion 1 are fixed by cord 3 deep enough in shot hole 7 so that between plug 6 and charge 8 the necessary exploding space is kept free and plug is kept firm, while by means of rammer 10 the soft plug 6 is forced into shot hole 7. The remaining part of the mouth of the shot hole 7 is filled up and sealed by means of the usual clay substances 11 bringing the shot hole into readiness for blasting.

Figs. 13 and 14 show a plug insert for shot hole 7 with greater diameter. Same consists of an incombustible flat disc of asbestos or similar material the longer middle axis of which is a little greater than the diameter of shot hole 7. The shorter sides of disc 12 are fitted to shot hole 7 by corresponding rounding off of latter. (Fig. 6.) One end of disc 12 is provided with two holes close together through which electric wire 14 is drawn, being threaded in at one hole and out at the other so that both ends of cord 14 find themselves on the same side of plug insert 12. The insert 12 together with inserted cord 14 are then placed and sealed in soft clay plug 6 according to Fig. 7, thus making the soft plastic plug ready for use. The finished clay plug is then inserted in the usual manner to a certain depth in shot hole 7. Both ends of cord 14 are then taken hold of and plug 6 is driven into the shot hole by means of rammer 10 whereby by appropriate pulling at cord 14, insert 12 embedded in the clay plug mass, is raised and the charge exploded in shot hole 7 as illustrated in Fig. 5.

After raising insert 12 and exploding one end of cord is freed and cord 14 is withdrawn for further use by means of the other end. The insert

12 may be employed in the shot hole in any position thought suitable, e. g., vertically, horizontally, etc., whereby besides insert 12 sufficient space remains free for electric wires 9 in the clay mass of the plug—Fig. 6—so that same can not be damaged.

On plug 6 the usual clay material 11 is then pressed into shot hole 7 and the latter sealed—Fig. 1.

In the same way as disc insertion 12, the round insertion 1 may be provided with either two holes near each other or besides the middle hole 2 also a groove 15—Fig. 3—or something similar for the removal of electric wire. The plug inserts above described are made of asbestos and are extremely simple and very light so that any number of same may be carried in the pockets, etc., without danger of breakage, and the entire plug of soft clay which is prepared at the place of using remains perfectly soft and plastic so that no damage of electric wire insulation may be caused by the plug nor is any premature explosion of the charge by friction possible.

The plug inserts along with the clay housing may also be used as a support in shot hole 7 behind charge 8 in place of the spare inserts used at the present time behind the charge. As shown in Figs. 3 and 4 the insert 12 is introduced into the shot hole to a certain depth by means of the usual rammer 10 which has a corresponding groove 16 the size of insert 12 and a cross groove 17 for the leading cord of insert 12. After the introduction of plug insert, rammer 10 is withdrawn a little way, whereby through tightening the cord 4 and pushing rammer 10 the support 12 is raised in the shot hole and solidly wedged in accordance with Fig. 3 so that the cord may be removed. Now the charge 8 is forced into shot hole 7 up to the support 12 and the shot hole closed in the prescribed manner.

In this way any additional space required in the shot hole without using present day spare inserts may be achieved before and behind the charge. The cord 14 of support 12 may also serve very well in this case for drawing back charge 8 in the shot hole according to Fig. 10. For this purpose a sling 18 is formed on the taut cord 14 which is drawn through the holes 13 in the solidly wedged insert 12 and the charge 8 is inserted, which may then be drawn into shot hole 7 up to insert 12 by pulling on the other end of cord 14, according to Fig. 2

The further pieces of charge 8 are brought into the shot hole in the same way, quite close together or, if desired, following each other at certain intervals which may be measured exactly by cord 14.

This sort of loading is especially appropriate for steep shot holes as the whole charge really hangs here on insert 12 so that the charge can not fall out before closing the shot hole.

The introduction of charge 8 to a certain depth in a horizontal shot hole can also be made with rammer 10 alone according to Fig. 4 which for this purpose is provided with separating notches or cuts 15, e. g., at 10 cm. distance from each other. With the aid of the separating notches 15 the necessary depths for introduction of charge 8 may be exactly determined. For marking different depths rammer 10 is provided with sliding ring 15' by which a too deep insertion of rammer 10 and thereby also of charge 8 into shot hole 7 is prevented. In this way the charge may be distributed in the shot hole as required without the use of spare inserts.

I claim:

1. A plug for a shot hole for blasting comprising the combination of a cylindrical flat insert of incombustible material provided with an opening, a pulling member comprising a flexible cord anchored in said opening, and a plastic body formed around and embedding said insert and the anchored portion of the cord.

2. A plug for a shot hole for blasting comprising the combination of a flat insert of incombustible material provided with openings offset with respect to the medial portion of said insert, a pulling member comprising a flexible cord threaded through the openings, and a plastic body formed around and embedding said insert and the portion of the cord threaded through said openings.

3. A plug insert for a shot hole for blasting comprising a flat insert having parallel sides and a width less than the diameter of the shot hole, the length of said insert being greater than the diameter of the hole and rounded off at the ends therefore in accordance with the curvature of the shot hole, and said insert being provided with adjacently arranged openings offset with respect to the medial portion of the insert and adapted to receive a flexible pulling member threaded through said openings.

4. A plug for a shot hole for blasting comprising the combination of a flat insert of incombustible material provided with an opening therein, a pulling member comprising a flexible cord anchored in said opening, and a cylindrical plastic body formed around and embedding said insert and the anchored portion of the cord, said insert being embedded in the plug in a plane transversely inclined to the axis of the plug.

5. Means for supporting an explosive charge in a shot hole comprising in combination with a ramming member having a notch formed in the end thereof and a longitudinally extending groove, of a flat insert of incombustible material receivable in said slot and confined between the latter and the wall of the shot hole, said insert having a pair of adjacently disposed openings offset with respect to the medial portion of said insert, and a pulling member comprising a flexible cord threaded through the openings and extend along the longitudinally extending grooves of the ramming member, so that on pulling the flexible cord the insert will be wedged in the shot hole at the position determined by the end of the ramming member within the shot hole.

6. A method of charging an upwardly inclined shot hole by means of an insert having a longitudinal dimension slightly greater than the shot hole and a cord slidably threaded through said insert consisting in ramming the insert into predetermined position in the shot hole, wedging the insert in said shot-hole, fastening the explosive charges at spaced intervals to one end of said cord, pulling the other end of said cord to draw the explosive charges into the shot hole, and sealing the shot hole.

FRANTIŠEK STRUŽÍK.