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BRIDGE FOR PLUGGING HOLES

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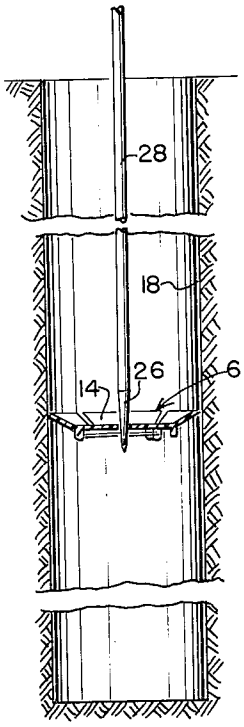


FIG. 3

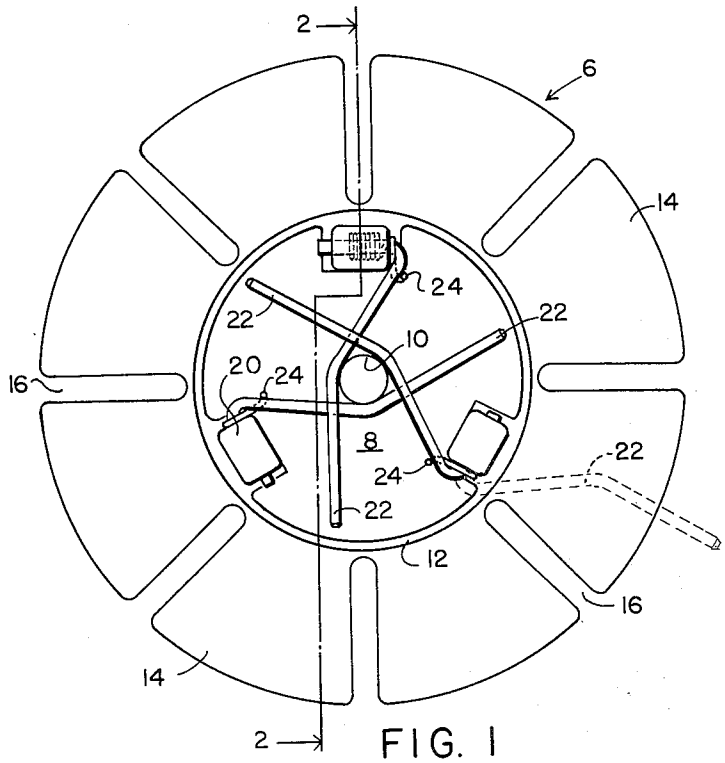


FIG. 1

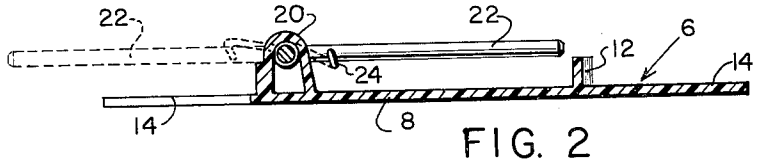


FIG. 2

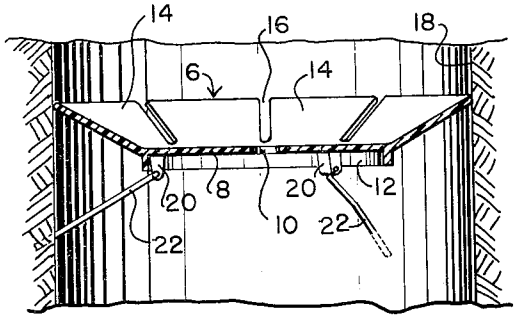


FIG. 4

INVENTOR

MARVIN C. KOOP

BY John N. Wilkinson

ATTORNEY

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BRIDGE FOR PLUGGING HOLES

Marvin C. Koop, Wichita, Kans.
(2933 Chapel Hill Road, Oklahoma City 20, Okla.)

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This invention relates to sub-surface exploration. In a more specific aspect this invention relates to means used in carrying on exploration for minerals. In still a more specific aspect, this invention relates to means for plugging holes bored in the earth. Yet a more specific aspect of this invention relates to well bridge means for plugging holes which have been drilled or bored in the earth. More specifically the invention relates to plugging so-called "shot" holes bored in the earth for carrying on sub-surface exploration, such holes being used in what is commonly called geophysical exploration. And, in yet a more specific aspect, this invention relates to a well bridge for plugging bored holes or shot holes in the earth used in carrying on geophysical exploration, such well bridge being insertable and positionable in the shot hole with a usual loading pole or rod being used as a positioning rod and having a "stinger" thereon, like that pole and stinger commonly used in geophysical operations to charge the shot holes with explosives, such well bridge being mounted on the stinger on the end of the loading pole during insertion and releasable from such positioning means to remain in blocking relation to the shot hole upon withdrawal of the positioning rod and stinger.

Exploration for minerals and to determine sub-surface geology has long been known in the art. In carrying on such geophysical exploration it is common practice to "shoot a field." This is accomplished by drilling a plurality of predetermined holes in regard to position in the earth. These holes are charged in the bottom thereof with explosive. The explosive is set off to create shock waves and sound waves which reflect from the strata and formations of different kind in the earth sub-surface. The direct and reflected waves are accounted for or picked up and recorded by suitable geophysical equipment, and interpreted to obtain the sub-surface geology. It is most common to use such methods to determine the likelihood of petroleum bearing formations in the earth. The exploration shot holes are bored or drilled into the earth and vary in depth from a relatively shallow hole of from 25 to 50 feet up to a hole a hundred feet or more in depth. The diameter of the usual exploration shot hole will vary from 4¼ inches to 5⅝ inches. These holes after use usually remain in open condition at the surface, being undisturbed at or near the surface by the explosion of dynamite at the bottom of the hole which is relatively greatly removed from the surface. As a result, a dangerous situation is created. Human beings and particularly livestock have been known to break their legs by stepping in an open abandoned shot hole. Some States have laws requiring the plugging of the shot holes to prevent accidents such as this.

Means are known to be used in plugging these shot holes in the earth after use. The means known in the prior art are not very reliable in use, are expensive, and require extra or cumbersome equipment to place them in the bore or shot hole in position. Normally the well bridge is positioned and placed in the shot hole at a depth of approximately 10 feet, and the hole thereabove filled with earth, gravel, rocks, other suitable debris, and the like. Some of the well bridges of the prior art have basket-like means which are made of fabric which will rot or otherwise deteriorate. Some of them are not designed for engaging the walls of the hole

properly, and as a result they collapse and fall down in the hole to be of little or no value in plugging same.

The new bridge means for plugging holes in the earth of my invention overcomes all of the disadvantages of those of the prior art. The new bridge of my invention is very easily positioned at the desired depth in the shot hole by means which the geophysical crews always have and use to load the shot hole with dynamite for shooting a field. A length or lengths of common hole charging or loading rod can be used, and desirably so, and the usual stinger mounted on the lower end of the rod is employed. This provides the inserting and positioning rod for utilizing my new well bridge. The new bridge for plugging holes in the earth of my invention readily lends itself to being constructed of plastic material of a flexible nature, such resulting in a well bridge which will last forever to support the earth, rocks, etc., used to fill the shot hole above the bridge, and the new bridge can be made of plastic materials such as the vinyls, polyethylene, polystyrene, and the like, resulting in a permanent bridge. The new well bridge of my invention is easily made, and it is very convenient and reliable in use.

Structurally, the bridge of my invention for plugging holes in the earth has a body. This body has an aperture therethrough, preferably in a central portion thereof. The body of the bridge has flexible portions which are engageable with the wall of a shot or bored hole in the earth to provide an obstruction in the hole when the bridge is mounted therein. An arm member is mounted on the body, and this arm member is extendable to penetrate the wall of the bore hole for resisting movement of the bridge downwardly therein when mounted in the hole. This arm is retractable, and when retracted can be held so by a positioning rod mounted in the aperture through the body. This is done when the bridge is inserted in the bore hole while on the positioning rod. With the bridge in desired position in the bore hole, the arm is extended for bore hole wall penetration by removing the rod.

It is an object of my invention to provide new exploration means.

It is another object of my invention to provide new well bridge means.

Another object of my invention is to provide new means for plugging holes in the earth.

Still another object of my invention is to provide new bridge means for plugging shot or bore holes in the earth used in carrying on geophysical exploration for determining sub-surface geology.

It is still another object of my invention to provide new bridge means for plugging shot holes in the earth used in geophysical exploration for determining sub-surface geology, which can be used with the usual and common loading rod links and stinger utilized in loading the shot holes with dynamite, such rod and stinger being the positioning rod means for inserting and desirably positioning the well bridge means of my invention in the shot hole.

Still another object of my invention is to provide a well bridge for plugging shot or bore holes in the earth which will remain therein as an obstruction in the hole to support the hole filling material thereabove indefinitely, and which is easy to manufacture and use, and which is economic to manufacture and use, and which is reliable in use.

Other objects and advantages of the new bridge means for plugging holes in the earth of my invention will become apparent to those skilled in the art upon reading this disclosure.

Drawings accompany and are a part of this disclosure. These drawings depict preferred specific embodiments of

the new bridge means of my invention for plugging holes in the earth, and they are not to unduly limit the scope of my invention.

In the drawings,

FIG. 1 is a bottom plan view of a preferred specific embodiment of bridge means of my invention.

FIG. 2 is a view taken on line 2—2 of FIG. 1.

FIG. 3 is a longitudinal view showing the well bridge in place in a shot hole, with the bridge proper in cross sectional view, and with the positioning rod in inserting position.

FIG. 4 is an enlarged view of the bridge in hole obstructing position in the shot hole, with the bridge proper in cross sectional view.

The following is a discussion and description of the new bridge means of my invention for plugging holes in the earth. The discussion and description is made with reference to the drawings whereon the same or similar parts and/or structure are indicated by the same reference numerals. The discussion and description is of preferred specific embodiments of the new bridge means of my invention for plugging holes in the earth, and it is to be understood that such discussion and description is not to unduly limit the scope of my invention.

Referring now to the drawings FIGS. 1–4, a preferred specific embodiment of the new bridge means of my invention for plugging holes in the earth is shown. This new bridge means is indicated generally by numeral **6**.

The bridge **6** has a thin circular body, which is preferably made of flexible material, such as relatively hard rubber, polyethylene plastic, polystyrene plastic, the vinyl plastics, and the like. The body can be made by any of the suitable molding procedures, preferably being made by injection molding. I have found it most suitable to make it of polyethylene plastic by injection molding using a female stationary die and a moveable male die. The plastic body of the bridge has a thin, relatively rigid, circular and imperforate center portion **8** with a center hole **10** therethrough. Around the periphery of the center portion **8** on the underneath side thereof is formed an integral rim portion **12**. This rim portion **12** is preferably relatively narrow as shown in the drawings, and projects downwardly from the center portion **8**. The rim **12** provides for rigidity of the center portion **8**, and I have found that such a rim allows center portion **8** to be made approximately the same thickness as the remainder of the body.

The outer portion of the body of bridge **6** is segmented circumferentially to have a plurality of integral portions **14** radially projecting from the center portion **8** and bendable adjacent the rim **12** portion of the body. The flap portions **14** are separated from each other along their sides by spaces **16** therebetween. The spaces **16** can be created originally in molding the body, or they can be cut out from a solid molded body.

In use, these flexible portions **14** engage the wall of a shot or bore hole in the earth to provide for bridge **6** to form an obstruction across the shot or bore hole. This position of flexible portions **14** is shown in FIGS. 3 and 4 of the drawings. In FIG. 3, the bridge **6** is shown being inserted into bore or shot hole **18**. During inserting of bridge **6** into hole **18**, the flexible portions **14** bend upwardly with the outer edges thereof in direct contact with the walls of hole **18**. To provide for this, I have found that a desirable diameter for the body member of bridge **6** is about 6¾ inches for the usual size of geophysical shot hole.

Within rim **12** and underneath center portion **8** are preferably integral mounting portions or members **20**. These mounting portions **20** are preferably open in the ends, and rim **12** can, if desired, form the outer wall thereof. Of course, if desired, mounting members **20** can be separately mounted on the body of bridge **6** by suitable methods and means, and they can be formed

of any suitable materials such as plastic, metal, rubber, etc.

A plurality of arm members **22** are pivotally mounted in their inner end portions in mounting members or portions **20**, and they are spring-loaded with helical springs **24** attached thereto (as shown in FIGS. 1 and 2), in the other end suitably anchored or mounted in mounting member or portions **20** to furnish the backing for spring **24**. The springs **24** act in torsion to urge and provide for extending arms **22** so that they project out past the periphery of bridge **6**, such being shown by the arms in dotted lines in FIGS. 1 and 2, and in FIG. 4 which shows the bridge in operating position in hole **18**. The arms **22** are so pivotally mounted in mounting members or portions **20** to be retractable to the solid line position of FIGS. 1, 2 and 3, which is the position of arms **22** while bridge **6** is being inserted into shot hole **18** (FIG. 3). In extended position (FIG. 4) the arms penetrate the walls of hole **18** to prevent movement of bridge **6** downwardly under the weight of concrete, dirt, rocks, debris of other nature, etc., which is placed in hole **18** to plug same above bridge **6**.

The arms **22** are preferably made of metal, steel wire having been found suitable, and they are bent centrally as shown in FIG. 1 so as to be when retracted and crossed relative to each other, adjacent and encompassing hole **10** through center portion **8** of the bridge **6** body. A "stinger" **26** on the end of loading pole **28** is inserted through hole **10** from above for inserting brige **6** in hole **18**. Arms **22** under tension from springs **24** to extend same bind against or are held by the portion of stinger **26** projecting downwardly through hole **10**, and arms **22** are held from extending during insertion of bridge **6** into hole **18** by this portion of stinger **26**. The stinger **26** and loading pole **28** which serves as the positioning rod for bridge **6** are commonly used by geophysical crews in loading shot hole **18** with dynamite for shooting a field. The stinger **26** is a tapered metal pin normally about 4 inches long.

To prepare the bridge **6** for insertion into the hole **18**, the arms **22** are folded to the position shown in the solid lines in FIGS. 1 to 3. With the arms in this retracted position the "stinger" **26** on the end of a loading pole **28** is inserted through the hole **10** to be in position relative to the body **6** as shown in FIG. 3. With the "stinger" **26** in this position, the arms **22**, which are bent centrally as shown in the figures, will be urged against the "stinger" **26** in binding relation by the springs **24** and are held in the retracted position as long as the "stinger" **26** remains in this position. With the bridge **6** thus mounted on the "stinger" **26**, the device is ready to be inserted into the hole **18**.

With bridge **6** mounted on stinger **26** which in turn is threadedly secured as is normal to rod **28** (FIG. 3), the bridge **6** is pushed down into hole **18** the desired depth, usually about 10 feet. When in desired position, force is exerted upwardly on rod **28** having stinger **26** thereon. Stinger **26** is thus withdrawn from hole **10** to release arms **22**. Whereupon, springs **24** extend arms **22** to engage them with the walls of holes **18** in penetrating position (FIG. 4). It is easy to withdraw rod **28** and stinger **26**, because flap portions **14** in pressure engagement with the walls of holes **18** resist movement of bridge **6** back up hole **18**. The force of the springs **24** which urge the arms **22** against the "stinger" **26**, and thus retain the arms **22** in the retracted position, is not so great that the rod **28**, with the attached "stinger" **26**, cannot be withdrawn from the hole **10** when the bridge **6** is in the desired position in the hole.

With the bridge **6** in hole bridging position (FIG. 4), concrete or available debris is shoveled or otherwise put into the hole up to the surface to plug hole **18**.

As will be evident to those skilled in the art, various modifications of this invention can be made, or followed, in the light of this disclosure and discussion, without de-

parting from the spirit or scope of the disclosure or from the scope of the claims.

I claim:

1. A bridge for use in plugging bore holes in the earth comprising, a thin circular body member of flexible material having a thin, relatively rigid, circular and imperforate center portion with a center hole therethough and a relatively narrow downwardly projecting rim portion around the periphery of said center portion on the underneath side thereof, the outer portion of said body member being segmented circumferentially to have a plurality of integral portions radially projecting from said center portion and bendable thereat whereby said last-named projecting portions can engage the wall of a bore hole in the earth to provide an obstruction across said bore hole, a plurality of spaced arms pivotally mounted in the inner end portions thereof in apertures in integral mounting portions on said underneath side of said center portion of said body member and adjacent said peripheral rim thereof, each of said arms having a spiral spring operatively attached thereto and to said body member to urge said arms into extended position whereby in such position said arms extend out past the periphery of said body member to engage said wall of said bore hole for preventing movement of said body member downwardly therein, and said arms being bent centrally and retractable and crossable relative to each other to lay adjacent said hole in said center portion of said body member and in held engagement by the pressure of said spiral springs with a tapered pin on the end of positioning rod inserted in, extending through and frictionally engaged in said last-named hole to be held thereby while said body member is inserted in said bore hole in earth on the end of said rod, and said arms extendable by said spiral springs upon removing said tapered pin.

2. A bridge for use in plugging bore holes in the earth comprising, a thin central body having an aperture therethrough, a plurality of upwardly and downwardly flexible, thin and spaced portions integral with said body and projecting radially therefrom, said projecting portions engageable with the wall of a bore hole in the earth to provide an obstruction across said bore hole when said bridge is mounted in said bore hole, a plurality of spaced spring-loaded arms pivotally mounted on said central body to be extendable outwardly beyond the periphery of said projecting portions to engage and extend through said wall of said bore hole for resisting movement of said bridge downwardly therein when so mounted, said arms being constructed and mounted in position on said body to retract to lay transverse each other in substantially coplanar relation adjacent said aperture in said central body in held engagement by pressure exerted by the means spring loading said arms and in contact with a tapered pin on the end of a positioning rod mounted in said aperture while said bridge is inserted in said bore hole in the earth on the end of said rod, and said arms so extendable upon removing said tapered pin.

3. A bridge for plugging holes in the earth comprising, a thin body having a plurality of thin upwardly and downwardly flexible portions in a peripheral portion thereof and an aperture in a central portion thereof, said flexible portions engageable with the wall of a bore hole in the earth to provide an obstruction in said bore hole when said bridge is mounted in said bore hole, a plurality of elongated spring-loaded arm members pivotally mounted in an end portion on said body to be extendable beyond the periphery of said flexible portions to engage and penetrate said wall of said bore hole for resisting movement of said bridge downwardly therein when so mounted, said arm members being constructed and mounted in position on said body to retract to lay transverse each other in substantially coplanar relation adjacent said aperture in said central portion of said body in held engagement by pressure of the means spring-loading said arm members and in contact with a positioning rod mounted in said aperture, and said arm members extendable by pressure of the means spring-loading said arm members upon removing said rod from said aperture.

4. A bridge for plugging holes or the like in the earth comprising, in combination, a body having an aperture therethrough and outer flexible members therewith engageable with the wall of a bore hole in the earth to provide an obstruction in said bore hole when said bridge is mounted in said bore hole, arm means movably mounted on said body and having engaging portions retractable to a position adjacent said body and extendable to a position beyond the outer limits of said flexible members when said bridge is mounted in said bore hole in use, said arm means when extended in use penetrating the wall of said bore hole to resist downward movement of said bridge, resilient means with said arm means urging said engaging portions thereof into the extended position, said arm means being constructed, positioned and mounted on said body so that when in retracted position pressure exerted by said resilient means urges said arm means into contact with a positioning rod when mounted in said aperture while said bridge is being inserted into said bore hole on said positioning rod, and said arm means being extended by said resilient means upon removal of said rod from said aperture.

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