

[54] SELF-SEALING IGNITION DEVICE

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[56] References Cited

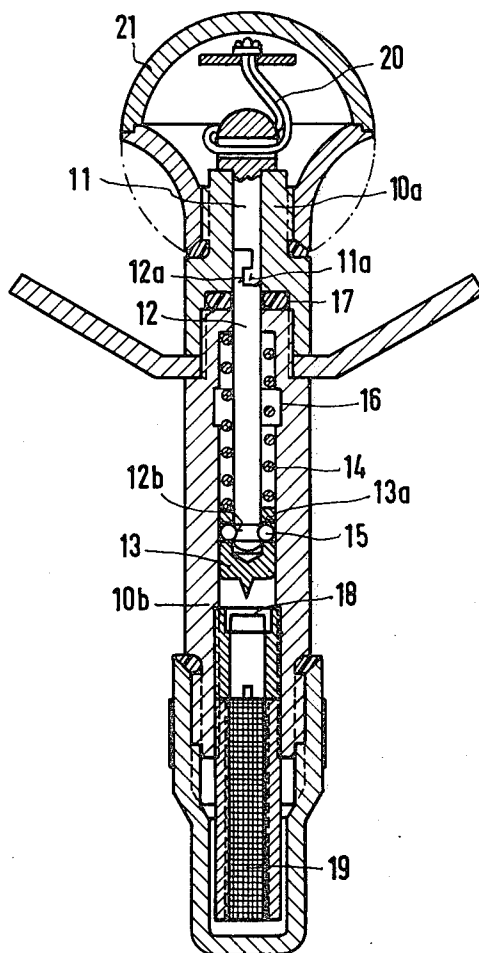
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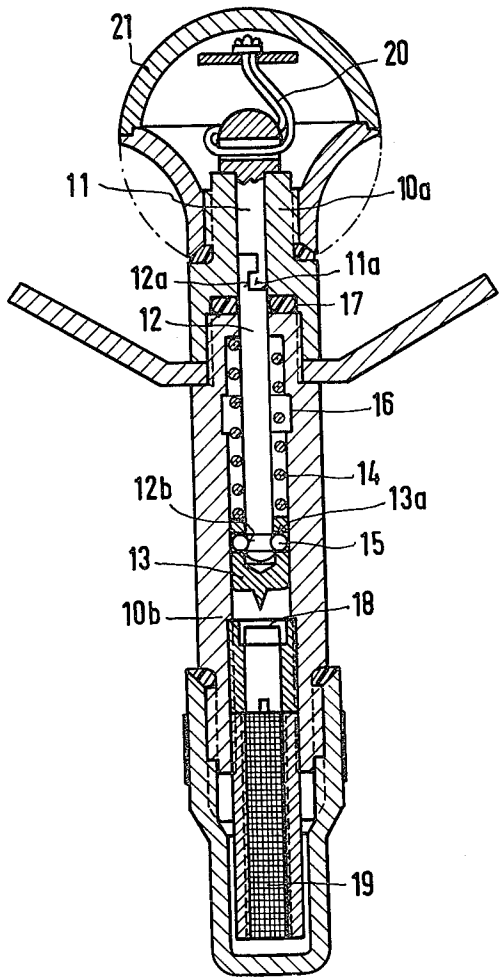
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[57] ABSTRACT

A firing pin igniter has a firing pin comprising three releasably connected parts. An upper part is manually shiftable to lift the middle and lower parts within a bore of the igniter housing. When predetermined movement of the middle and lower parts occurs, the lower part is released and is spring biased against a percussion cap. Subsequently, the upper part is released from the middle part with the middle part remaining in the housing bore to seal the bore from moisture. A sealing washer may be disposed in the bore to enhance the sealing effects.

9 Claims, 1 Drawing Figure





SELF-SEALING IGNITION DEVICE

BACKGROUND AND OBJECTS OF THE INVENTION

The invention relates to a firing pin igniter which can be released with a pull-cord. Devices of this type consist of a cylindrical housing, in which a percussion cap and possibly a delay action composition are housed, and in which a firing pin slides. The firing pin can be cocked by means of a compression spring, and can be set to "fire" by means of a shiftable locking member.

Such firing pin igniters are known, for example, from German patent 1,213,326 and they serve as so-called manually operated friction igniters for igniting detonators, hand grenades etc. One disadvantage of the known manually operated friction igniters of this type of construction consists in the fact that they are susceptible to the influence of moisture. It is true that in the case of the known design the locking member is developed as a plug, divided several times in a longitudinal direction, which offers a certain amount of protection against moisture. This protection against moisture however, will be insufficient because a really tight press fit of the locking plug in the cylinder housing would prevent a perfect pulling-off of the igniter. Above all, however, in the case of the known igniter, the cylinder housing will be completely open after pulling the locking plug from said housing, which makes a use of the igniter underwater impossible; after pulling out of the locking member by means of the pull-cord, water would immediately flow into the cylinder housing and would extinguish the already-ignited delay action composition.

Therefore it is the primary object of the invention to improve the manually operated friction igniters of the initially mentioned construction in such a way, that they will be absolutely moisture resistant and waterproof both prior to and after removal of the locking member.

It is another object of the invention to render such igniters easily actuable in accordance with conventional operation procedure.

SUMMARY OF THE PREFERRED EMBODIMENT OF THE INVENTION

At least some of these objects are solved according to the invention through the fact that the firing pin consists of three parts releasably connected with one another. These parts comprise an upper part, representing the locking member and which can be pulled out of the cylinder housing; a middle part which can be shifted within the cylinder housing and which can remain sealed in the housing; and a lower part representing the striker plate and slideable in the cylinder housing. As a result of this trisection of the firing pin, whereby the sealing middle part will remain in the cylinder housing even after pulling out of the locking upper part, a continuous and secure closure of the igniter against moisture and water will be assured. Thus the igniter will not only have a particularly good stability during storage even in climatically unfavorable areas, but beyond that it will also be suitable for underwater use.

THE DRAWING

An embodiment of the invention is shown in the drawing by way of example, the FIGURE showing a

longitudinal section through a manually operated friction igniter.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

According to the drawing, the igniter has a cylindrical housing 10a, 10b, which comprises an igniter head 10a and an igniter neck 10b. The head 10a and neck 10b can be threadably secured together and attached to a suitable explosive device in a conventional manner. In a bore of the cylinder housing there is disposed a tripartite firing pin 11, 12, 13. The firing pin upper or outer part 11 represents the locking member, customary in case of such igniters and has a hook-like extension 11a, which engages a constriction or recess 12a of the firing pin-middle part 12. The firing pin middle part 12 comprises a shaft, which is surrounded by a helical compression spring 14. The firing pin lower or inner part 13 represents the customary firing pin plate and is connected with the middle part 12 by way of connecting balls 15. These balls partially engage a constriction or recess 12b of the firing pin middle part 12 and partially engage bores 13a in an overlapping edge of the plate 13. Furthermore, an escape groove 16 for the connecting balls 15 is moulded into the cylinder neck 10b. A sealing ring washer 17 is clamped between the parts 10a and 10b of the cylinder housing and presses against the pin middle part 12 above the area of the compression spring to seal the bore, and thus is of considerable importance.

Below the firing pin plate 13 there is a percussion cap 18 in the customary manner, and below this a small delay action tube 19. Likewise, in the customary manner, the firing pin locking member 11 is connected with a manually operable pull cord 20, which is attached at its other end to an unscrewable cap 21.

OPERATION

Upon unscrewing the cap 21 and pulling outwardly thereon, the pull-out cord 20, attached to the cap 21 will pull the lower part 11 outwardly. The middle part 12 and the firing pin plate 13 are pulled outwardly with part 11. The compression spring 14 is at the same time, cocked. Eventually the two balls 15 are moved to where they enter the escape groove 16 on the igniter neck 10b. As a result of that, the firing pin plate 13 is released and strikes the percussion cap 18 with the force exerted by the compression spring 14. The percussion cap on its part ignites the small delay action tube 19.

Upon further pulling up of the locking member 11 beyond the edge of the igniter head 10a, the hook-extension 11a slips out of its slidable connection with the constriction 12a of the middle part. The middle part 12 thus remains stuck in the cylinder housing while maintaining its seal. From all this it follows that the middle part 12 is in connection with the seal ring washer 17 and securely seals the bore of the cylinder housing 10a, 10b, not only prior to but also after the functioning of the igniter. Contrary to the previously known igniters, this present igniter therefore can also be used underwater, since even after pulling out of the locking member 11 from the cylinder housing, and the impact of the firing pin plate 13 on the percussion cap, no water can reach the small delay action tube 19 through the bore of the cylinder housing.

Naturally, there can be many constructional developments and modifications of the invention. Preferably, the seal ring washer 17 is an O-ring made of rubber or plastic, say teflon or polyethylene; it can also consist of a teflon cord. By screwing the igniter head 10a and the igniter neck 10b together, the seal ring washer will be pressed against the firing pin middle part 12. Various possibilities of construction are also possible for the releasable sliding connections between the three parts of the firing pin, but it is mainly desirable in the preferred embodiment that upon pulling-out of the firing pin upper part 11, the three parts can separate, preferably in such a way that first of all the firing pin plate 13 is released by the middle part 12 and shortly thereafter the middle part 12 is released by the locking member 11.

SUMMARY OF MAJOR ADVANTAGES AND SCOPE OF THE INVENTION

By virtue of the present invention, in which a portion of the firing pin remains in the housing bore during ignition, an effective seal is provided. Consequently, the ignition apparatus can be used underwater.

An effective moisture seal during storage and underwater use is further enhanced by the sealing washer which engages the plug or middle part of the firing pin.

Significantly, these advantages are provided without changing the basic procedure for operating the device.

Although the invention has been described in connection with a preferred embodiment thereof, it will be appreciated by those skilled in the art that additions, modifications, substitutions and deletions not specifically described may be made without departing from the spirit and scope of the invention as defined in the appended claims.

What is claimed is:

1. In a firing pin ignitor suitable for release by a pull-cord, said ignitor including a housing having a bore, a percussion-sensitive charge in said housing, and activating means for activating said charge while maintaining a moisture seal before and after activation of said charge; said activating means comprising:

sealing means operable to seal said bore against moisture;

spring means in said housing;

a firing pin slidably disposed in said bore of said housing, said firing pin including:

an outer part outwardly removable from said housing,

an inner part including a portion arranged to displace said spring means in an energy-storing manner during outward movement of said firing pin to impart inward biasing force to said inner part, and

a middle part;

said middle part being releasably coupled to said inner part by first connecting means arranged to release said inner part for movement toward

said charge after said spring means has been displaced during outward movement of said firing pin;

said middle part being releasably coupled to said outer part by second connecting means arranged to release said middle part from said outer part subsequent to said release of said inner part and while said middle part and said sealing means are in sealing relationship relative to said bore, so that said middle part seals said bore subsequent to activation of said percussion-sensitive charge by said inner part.

2. Apparatus as defined in claim 1 wherein the releasable connections between said outer and middle parts and between said middle and inner parts are slidable connections.

3. Apparatus as defined in claim 2 wherein the slidably releasable connection between said outer and middle parts comprises a hook-like extension of said outer part which seats within a recess of said middle part.

4. Apparatus as defined in claim 2 wherein the slidably releasable connection between said middle and inner parts comprises a plurality of connecting balls mounted partially in recess means of said middle part and partially in recess means of said inner part; said housing bore including escape groove means disposed for alignment with said connecting balls in response to said predetermined movement of said firing pin such that movement of said connecting balls into said escape groove releases said inner part from said middle part.

5. Apparatus according to claim 3 wherein the slidably releasable connection between said middle and inner parts comprises a plurality of connecting balls mounted partially in recess means of said middle part and partially in recess means of said inner part; said housing bore including escape groove means disposed for alignment with said connecting balls in response to said predetermined movement of said firing pin such that movement of said connecting balls into said escape groove releases said inner part from said middle part.

6. Apparatus as defined in claim 1 wherein said sealing means comprises a seal ring washer disposed in said housing remote from said spring; said seal washer being arranged in said bore to sealingly engage said middle part before and after activation of said charge.

7. Apparatus as defined in claim 3 wherein said sealing means comprises a seal ring washer disposed in said housing remote from said spring means; said seal washer being arranged in said bore to sealingly engage said middle part before and after activation of said charge.

8. Apparatus as defined in claim 6 wherein said housing comprises a head section and a neck section arranged for threaded engagement; said seal washer being clamped between said head and neck sections.

9. Apparatus as defined in claim 1 including a delay action composition for the firing mechanism.

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