HYDRAULICALLY-OPERATED FIRE EXTINGUISHING DRILL

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References Cited
UNITED STATES PATENTS
1,412,430 4/1922 Verneuil 175/107 X
2,178,801 11/1939 Matten et al. 175/107 X
2,857,005 10/1958 Medlock 239/271 X
2,993,650 7/1961 Badberg 239/271

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ABSTRACT
A unique fire-extinguishing device for use on buildings and the like, comprising a rotary drill carried by a housing and having a cutting bit adapted to bore through side walls, roofs, doors, and the like of the building. The housing has a hydraulic fitting for attachment to a standard fire hose, and has an enclosed turbine arranged to power the rotary drill, utilizing the water pressure from the hose. Surrounding the drill shaft is a collar or sleeve connected so as to optionally also receive water from the hose and deliver the same at locations around the shaft and closely adjacent the cutting bit. Handles on the housing enable it to be manipulated in the manner of a power drill whereby the cutting bit together with the discharge end of the collar can be applied to the building structure to drill through the walls and enter the same. The water or other extinguishing liquid can thus be quickly introduced into a burning building structure by the simple act of applying the drill bit to the wall, door or the like, and drilling through the same, using the water not only as the power medium but also as the extinguishing means. The housing has a valve device by which the water can be selectively directed, so as to either fully or only partially power the drill, or else fully or partially bypass the collar. The valve device can also completely shut off the water supply, when this is desired. Drill bit extensions are provided to extend the drilling range so as to enable thick or deep wall or roof sections to be penetrated.

9 Claims, 13 Drawing Figures
HYDRAULICALLY-OPERATED FIRE EXTINGUISHING DRILL

BACKGROUND

This invention relates to fire extinguishing equipment, and more particularly to drilling devices intended to introduce water or other extinguishing liquid into normally inaccessible locations of a building or other structure.

Heretofore no satisfactory, modern method or equipment has existed to safely and quickly introduce water into a building structure at the vicinity of a fire burning therein. The classical procedure has been to break through windows with an axe or other tool, or else to break down or chop through a door, or to chop through a wall or roof in order to bring water to bear on the burning material. This prior procedure has been dangerous as well as time consuming. Where windows were broken, there was the likelihood of being injured by cut glass. When the fire was located closely adjacent the wall or door structure being penetrated, there also existed a danger from hot gases and flames, or explosive action and the like. Moreover, the use of axes was time consuming and required considerable effort, to the end that the fire often would continue burning, and thus spread considerably. The importance of time in extinguishing a fire during its early stages has always been well recognized. Although it has been proposed in the past to extinguish fires beneath large heaps of coal and the like, by the use of a hollow, hand-powered drilling device intended to supply extinguishing liquid or water through a hollow bit, such an arrangement is not suitable for building structures since it could not be used to penetrate stout structural walls, roofs, doors or the like. So far as I am aware there has never been produced a practical water or liquid powered drill capable of not only drilling through a building structure but also at the same time introducing water into the interior thereof.

SUMMARY

The above drawbacks and disadvantages or prior fire fighting methods and equipment are obviated by the present invention, which has for one object the provision of a novel and improved water or liquid powered rotary drill device utilizing the water from a fire hose, the device not only boring into a building structure but also employing the same water that powers the drill to extinguish the fire.

Another object of the invention is to provide an improved hydraulically operated combination drill and water nozzle as above set forth, which is powerful and efficient in its operation, readily handled by one person, quickly and easily controlled as to the directing of the water, and simple and economical in construction. These and other objects are accomplished by a unique combination of rotary drill, turbine power means therefor, and water discharge nozzle adjacent the drill bit, which enables various building structures to be quickly penetrated and supplied with water or other extinguishing liquid. The combination comprises a drill bit carried on a shaft which is turnably mounted in a housing that is arranged for connection to a standard fire hose. In the housing there is a turbine or impeller arranged to power the drill shaft and bit. Surrounding the shaft is a collar or sleeve which also receives water from the hose and directs it into the opening made by the cutting bit after the latter has cut through the building, wall or roof structure. The housing has handles by which it can be manipulated in the manner of an electric or powered drill. A manually operable valve means on the housing enables the water stream to be variously directed either fully into the building, or else with a partial flow into the building and a partial discharge from the housing, and the turbine element can be either fully or partially powered according to the requirements of the situation. Simple gearing in the housing provides the most advantageous drilling speed as related to the turbine speed. The entire device is relatively light in weight, and can be easily manipulated by a single person. The inlet and outlet fittings on the housing can be utilized as handles for manipulating the tool.

Still other features and advantages will hereinafter appear:

In the accompanying drawings:

FIG. 1 is a front elevational view of the hydraulically operated fire extinguishing drill of the invention.

FIG. 2 is a rear elevational view of the fire extinguishing drill.

FIG. 3 is a top plan view of the fire extinguishing drill.

FIG. 4 is a vertical section, taken on the line 4–4 of FIG. 2.

FIG. 5 is an end elevational view of the cutting bit of the drill.

FIG. 6 is a transverse section taken on the line 6–6 of FIG. 4.

FIG. 7 is a view partially in top plan and partially in horizontal section, of the valve device of the extinguishing drill shown in the shutoff position.

FIG. 8 is a view like that of FIG. 7, but showing the device in the full-power drilling position, with no water being used for extinguishing purposes.

FIG. 9 is a view similar to that of FIG. 7, but showing the valve device in operative position wherein the turbine is partially powered and water is being supplied to the drill bit, with a virtually full flow.

FIG. 10 is a similar view, showing the position which the valve occupies for no turbine rotation but with full extinguishing flow to the bit.

FIG. 11 is a plan view of a drill extension shaft which extends the drilling range of the bit.

FIG. 12 is a fragmentary top plan view of a universal coupling joint for connecting the fire extinguishing drill to a fire hose, and

FIG. 13 is a diagrammatic representation of the fire extinguishing drill connected through a valve to a water supply and also to a tank of CO₂.

Referring first to FIGS. 1–4, the improved hydraulically powered fire extinguishing drill of the invention comprises a composite housing part 20 having a turbine enclosure portion 22 arranged broadside to a gear box portion 24, the latter carrying an end plate 26 which is integral with a conical bearing and packing member 28 (FIG. 4). The end plate 26 has an anti-friction bearing 30 carrying a drilling shaft part 32 which is powered through a spur gear 33 carried thereon. The drilling shaft 32 has a hollow portion 34 extending through the bearing and packing member 28, and through a sleeve 36 carried in the end of the member. The member 28 has a central passage 38 through which the hollow portion 34 of the drilling shaft extends, and packing or sealing rings 40, 42 are disposed at the ends of the passage 38 and engage and seal against the shaft portion 34 and the member.
The shaft portion 34 is seen to project from the bearing member 28, and is provided with a bayonet configuration 44 at its end (FIG. 3), over which a drill bit adaptor or collar 46 can be slipped to detachably secure the latter to the drilling shaft. The adaptor 46 comprises an extension 48 on which there is mounted a drill bit 50, as by means of a threaded shank 52 thereof received in a threaded bore of the extension. The adaptor 46 and extension 48 thereof may therefore be considered as part of the drilling shaft 32 since it turns with the same and mounts and drives the bit 50.

In accordance with the present invention the hollow portion 34 of the drilling shaft 32 has a plurality of openings or slots 54 located within the passage 38 of the bearing member 28, whereby liquid introduced into said passage can be made to flow through said hollow portion. Also, the adaptor 46 is provided with a plurality of water or fluid passages 56 through which fluid in the shaft portion 34 can escape to the area surrounding the extension 48 of the adaptor, adjacent the drill bit 50.

According to the present invention, after the drill bit has been powered through the medium of the gear 33 and has cut through a wall, fluid under pressure can be introduced into the central passage 38 and discharged in the vicinity of the bit 50. Such discharge can also occur, if desired, while the drill bit is still being powered and driven. The bit is sufficiently large so that the hole which it cuts can loosely receive the adaptor 46 whereby the discharging fluid or water can be readily introduced behind a wall through which the bit 50 has cut.

Referring now to FIGS. 1 and 4, the power for the bit 50 is obtained by a water or fluid turbine assemblage powered in turn by the same water supply which is used to extinguish the fire, in accordance with this invention. To effect this the spur gear 33 is engaged and driven by a pinion 60 on a shaft 62 which is carried in bearings 64, 66. The shaft 62 mounts a turbine wheel or rotor 68 having buckets 70, said rotor being disposed in the turbine enclosure portion 22 of the housing. An end plate 72 is secured to said enclosure portion, and provides a circular cavity 74 constituting a vacuum relief and at one side of the rotor 68, which is utilized to relieve the running vacuum which is formed. The cavity 74 has a bleed aperture or vent opening 76 communicating with the exterior of the housing, for this purpose. An O-ring seal 78 carried by the end plate 72 provides a fluid-tight connection with the enclosure, and a baffle 80 carried by the end plate 72 encloses most of the cavity 74 except for a passageway 82. The plate 80 is disposed broadside to the turbine element and thus constitutes a partition in the turbine chamber 22. With such arrangement, the vacuum build-up in the space 84 located in the lower portions of the enclosure 22 in FIG. 4 is dissipated through the passageway 82, cavity 74 and vent opening 76.

The housing 20 has a fluid inlet fitting 86 provided with a usual threaded end portion 88 to receive the coupling of a fire hose, for example. Carried by the housing 20 at the fitting 86 is a valve device 90 comprising a valve housing 92, a plug-type valve 94 with shaft 44 on which it is carried, and a handle 98. A cover plate 100 closes the valve housing 92 and has a suitable bearing and packing means for the shaft 96. Communicating with the interior of the valve housing 92 is a port 102 having jet passages 104 adapted to bring fluid to the turbine rotor 68 so as to drive the latter.

As provided by the invention, the valve housing 92 is connected to the central passage 38 of the member 28 by means of an exterior, angle-shaped pipe 106, such pipe communicating with a port 108 of the housing. A third port 110 of the valve housing communicates with the hose fitting 86. The shape of the plug valve 94 is readily seen in FIGS. 7-10, which show cross sections cutting at right angles to the axis of the plug. In FIG. 7 the valve port 110 is completely closed so that no water or fluid can flow into the drill from the fitting 86 and fire hose attached thereto. In FIG. 8 the fitting 86 and port 110 are in communication with the turbine port 102, such that full flow of fluid is provided to the turbine rotor 68 for full powered drilling without water discharge at the drill bit. After the bit has penetrated a wall or other structure, the valve plug is placed in the position of FIG. 9 wherein water or extinguishing fluid is directed through the port 108 and pipe 106, to be discharged at the bit 50 while a portion of the flow is still directed to the turbine rotor to cause a limited turning thereof. This results in a desirable sprinkling action, since the discharging water at the drill bit is now given rotary swirl at a relatively slow rate of turning.

FIG. 10 shows the valve position for full flow of water to the bit and without any flow to the turbine. The drill bit remains stationary for this position.

From the foregoing it can now be understood that the invention provides a unique arrangement by which a rotary drill is powered with a pressure fluid which can also be utilized to effect the extinguishing action, as for example, after the drill has penetrated a wall or other structure.

The discharge of fluid from the turbine enclosure 22 occurs through a discharge fitting 114. It will be noted that the fittings 86 and 114 are so arranged as to constitute convenient handles, by which the extinguishing drill can be readily held and manipulated.

While the adaptor 46 is illustrated as being constituted of a single piece of material, it will be understood that it can as well be made up of several pieces secured together in any suitable manner.

FIG. 12 illustrates a universal joint coupling 116 which can be attached to the fitting 86 and also secured to the end of a fire hose (not shown) to provide for easier manipulation of the drill.

An extension shaft for the drill is illustrated in FIG. 11, comprising a fitting 120 adapted to receive the end of the shaft portion 32, and comprising a hollow shaft member 122 provided with a bayonet configuration 124 which is adapted to be received in the adaptor 46. Thus, the drilling operation can be carried out through thick walls and like structures to a greater depth, as determined by the requirements of the particular situation.

FIG. 13 illustrates the extinguishing drill of the invention connected to a selector valve 126 which in turn is connected to a pressurized container 128, carrying CO₂ or the like, and also to a fire hose line 130 whereby the fluid supplying the power for the drill can be water, and the extinguishing fluid can be either water or CO₂. The CO₂ can thus be employed optionally after completing the drilling by means of water power.

It will now be understood from the foregoing that I have provided a novel and improved, unique fire extinguishing device in the form of a hydraulically operated...
rotary drill which has considerable power to enable it to drill through a wall and other structures, and which provides a supply of extinguishing liquid in the area surrounding the drill bit whereby such liquid can be introduced behind the drilled wall and also swirled in the manner of a sprinkler.

The extinguishing drill of this invention is seen to be extremely simple, straightforward and economical to fabricate, and has been found to be especially effective and reliable in its operation. The device is thus seen to represent a distinct advance and improvement in the field of fire-extinguishing apparatus.

Variations and modifications are possible without departing from the spirit of the invention.

I claim:

1. A fire extinguishing device for buildings and the like, comprising in combination:
   a. a rotary drill comprising a shaft part and a cutting bit carried at the end of the shaft part,
   b. a housing part in which said shaft part is turnably mounted for rotation about its axis,
   c. means providing an inlet for liquid into said housing part,
   d. hydraulic impeller means powered by the liquid introduced into the housing part, for driving said shaft part,
   e. a collar located at the exterior of the housing part and carried by one of said parts, said collar extending closely adjacent said cutting bit,
   f. said collar and said housing part having passages for conducting liquid from the housing part through the collar and discharging the same adjacent said cutting bit, and
   g. manually engageable means carried by the housing at the exterior thereof, for enabling it to be grasped by the hands of a user and held in the manner of a power drill, said means including oppositely projecting handle structures on the housing.

2. A fire extinguishing device for buildings and the like, comprising in combination:
   a. a rotary drill comprising a shaft part and a cutting bit carried at the end of the shaft part,
   b. a housing part in which said shaft part is turnably mounted for rotation about its axis,
   c. means providing an inlet for liquid into said housing part,
   d. hydraulic impeller means powered by the liquid introduced into the housing part, for driving said shaft part,
   e. a collar located at the exterior of the housing part and carried by one of said parts, said collar extending closely adjacent said cutting bit,
   f. said collar and said housing part having passages for conducting liquid from the housing part through the collar and discharging the same adjacent said cutting bit,
   g. said housing part having means providing an outlet for discharging liquid therefrom, and
   h. a valving device in the housing part for diverting liquid from the inlet either to said collar or to said outlet.

3. The invention as set forth in claim 2, wherein:
   a. said valving device is capable of diverting all of the flow of said liquid to the outlet.

4. The invention as set forth in claim 2, wherein:
   a. said valving device is capable of diverting a portion of the flow of said liquid to the outlet.

5. The invention as set forth in claim 2, wherein:
   a. said valving device is capable of diverting all of the flow of said liquid to said collar.

6. A fire extinguishing device for buildings and the like, comprising in combination:
   a. a rotary drill comprising a shaft part and a cutting bit carried at the end of the shaft part,
   b. a housing part in which said shaft part is turnably mounted for rotation about its axis,
   c. means providing an inlet for liquid into said housing part,
   d. hydraulic impeller means powered by the liquid introduced into the housing part, for driving said shaft part,
   e. a collar located at the exterior of the housing part and carried by one of said parts, said collar extending closely adjacent said cutting bit,
   f. said collar and said housing part having passages for conducting liquid from the housing part through the collar and discharging the same adjacent said cutting bit,
   g. said housing part having a chamber,
   h. said impeller means comprising a turbine element disposed in said chamber, and
   i. means providing a bleeder aperture, communicating with said chamber to relieve vacuum build up therein.

7. The invention as set forth in claim 6, and further including:
   a. a baffle plate in said chamber, disposed broadside to the turbine element and confining the latter, said plate constituting a partition in the chamber which forms a vacuum relief area,
   b. said bleeder aperture communicating with said relief area.

8. A fire extinguishing device for buildings and the like, comprising in combination:
   a. a rotary drill comprising a shaft part and a cutting bit carried at the end of the shaft part,
   b. a housing part in which said shaft part is turnably mounted for rotation about its axis,
   c. means providing an inlet for liquid into said housing part,
   d. hydraulic impeller means powered by the liquid introduced into the housing part, for driving said shaft part,
   e. a collar located at the exterior of the housing part and carried by one of said parts, said collar extending closely adjacent said cutting bit,
   f. said collar and said housing part having passages for conducting liquid from the housing part through the collar and discharging the same adjacent said cutting bit, and
   g. speed reduction gearing driven by said impeller means and adapted to rotatably drive said shaft part for imparting power thereto.

9. A fire extinguishing device for buildings and the like, comprising in combination:
   a. a rotary drill comprising a shaft part and a cutting bit carried at the end of the shaft part,
   b. a housing part in which said shaft part is turnably mounted for rotation about its axis,
   c. means providing an inlet for liquid into said housing part,
   d. hydraulic impeller means powered by the liquid introduced into the housing part, for driving said shaft part,
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e. a collar located at the exterior of the housing part and carried by one of said parts, said collar extending closely adjacent said cutting bit.
f. said collar and said housing part having passages for conducting liquid from the housing part through the collar and discharging the same adjacent said cutting bit,
g. said cutting bit being removable from said shaft part, and

h. a shaft extension adapted to be fastened on one end of said shaft part,
i. said shaft part and said shaft extension having co-operative keying means on their juxtaposed ends for enabling locking engagement of the same, and
j. means carried on said extension, for locking the cutting bit thereto.