United States Patent [19]

Kanda

[11] **3,823,462**

[45] **July 16, 1974**

[54] **EXTRACTOR TOOL**

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[22] Filed: **Sept. 11, 1972**

[21] Appl. No.: **287,949**

[52] **U.S. Cl.** ..... **29/268,** 29/234, 29/282, 81/5.1 R, 81/302, 81/420, 81/425 A

[51] **Int. Cl.** **B23p 19/02**

[58] **Field of Search** ..... 29/244, 234, 268, 278, 29/280, 282, 270; 81/5.1 R, 3.05, 302, 418, 420, 425 A, 425 R; 7/3 R

[56] **References Cited**

UNITED STATES PATENTS

2,334,781	11/1943	Maines	81/302 X
2,364,953	12/1944	Daley	81/302

FOREIGN PATENTS OR APPLICATIONS

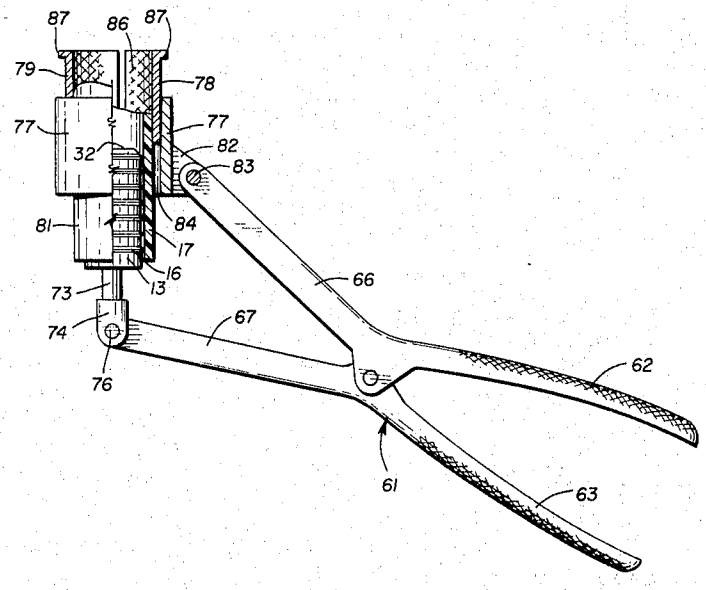
11,154	5/1899	Great Britain	81/302

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[57] **ABSTRACT**

A tool to facilitate the extraction of the broken components of a sprinkler system from the interior of conduit pieces used and/or to facilitate the disassembly of such sprinkler systems. The conduit is held while an element exerts a leverage derived force against the sprinkler system component whereby the conduit and component are moved reciprocally apart. Knurled or toothed surfaces are provided on element engaging faces for the efficient transmission of the leverage forces derived from plier or screw elements.

3 Claims, 6 Drawing Figures



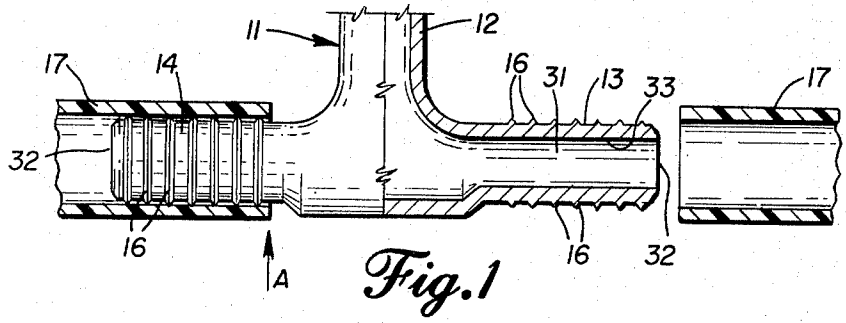


Fig. 1

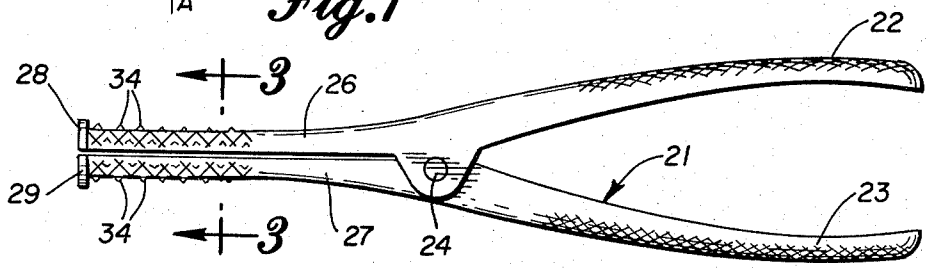


Fig. 2

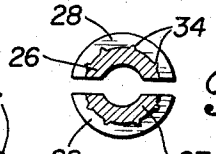


Fig. 3

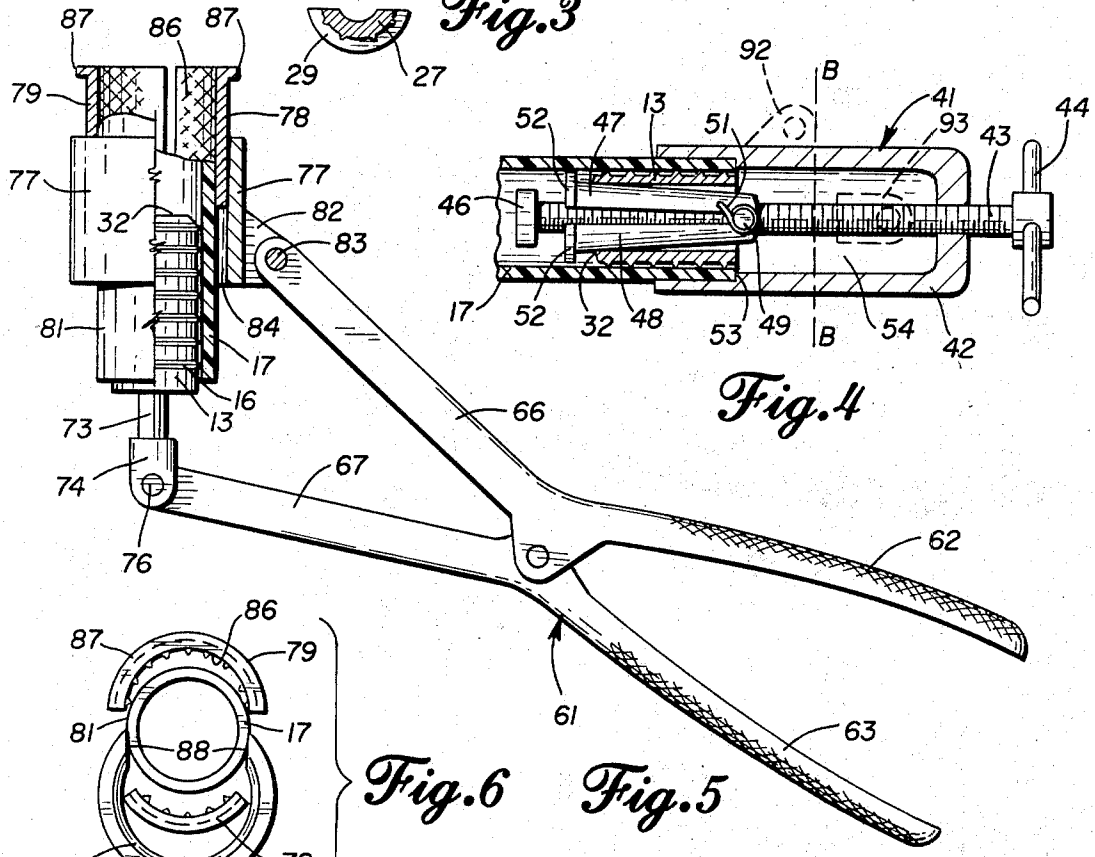


Fig. 5

Fig. 4

Fig. 6

EXTRACTOR TOOL

BACKGROUND OF THE INVENTION

Many household and commercial sprinkler systems are in present use where the conduits interconnecting sprinkler head or other system components are subjected to bending and tension stresses. Likewise the sprinkler head or other components may themselves be subjected to overload stresses which often cause the threaded or knurled sections that engage the conduits to break off within such conduit. Since the conduits are of a near exact length as necessary to connect adjacent sprinkler components, any shortening of the conduit in order to effect a repair might make reconnection impossible. Because of these factors it is desirable that the broken sprinkler component be extracted from the installed conduit so that the conduit end can again be interconnected to a replacement sprinkler component. The interfit between the telescopingly mated sprinkler component and conduit, however, is quite tight, and the extraction of broken pieces is accordingly quite difficult. At present workmen and householders must either precut and slit the broken stub, or they must exercise brute force against the stub and conduit in an attempt to remove the stub. Rupture and/or stretching of the conduit often results, and accordingly the manual exertions required are not always successful. If the conduit is ruptured, the system must be dug up or restrung, or at least it is necessary for a replacement piece to be spliced into position. It is a purpose of the present invention to provide various tool embodiments that can be used to facilitate sprinker system repairs.

SUMMARY OF THE INVENTION

The present invention provides various tool embodiments that are particularly adapted for extracting a broken stub of sprinkler components from its place of engagement with a sprinkler system conduit. Tool faces provide roughened surfaces for conveniently and securely gripping the sprinkler component and/or the conduit so that leverage forces can be applied to move such elements reciprocally apart. In separate embodiments of the invention extractor type pliers are used for exerting a spreading force with such force being used either to engage the sprinkler component stub or a gripping element of a tool assembly so the required extraction can be accomplished. Alternately, screw elements may be used for the generation of the required leverage force for exerting a pulling motion against the entrapped sprinkler component stub. In all instances it is an object of the invention to provide improved gripping and leverage exerging means that will facilitate the removal of broken stub components and/or the disassembly of sprinkler systems.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevation in partial cross-section showing features of a typical connection between a sprinkler system component and the fluid carrier conduits attached thereto,

FIG. 2 is a side elevation showing features of a plier extractor,

FIG. 3 is a cross-sectional elevation taken along the line 3—3 of FIG. 2,

FIG. 4 is a cross-sectional elevation showing an extractor using a screw type leverage system. Modifications for use of this type of extractor mechanism with plier type leverage component are indicated,

FIG. 5 is a side elevation in partial cross-section showing a further plier powered extractor tool, and

FIG. 6 is a top partial view showing additional features and elements of the FIG. 5 embodiment.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

In FIG. 1 features of a typical sprinkler system component 11 are shown. Usually the sprinkler component will be inclusive of an upright standpipe 12 that is flow connected to stub connectors 13 and 14. A plurality of ridges 16 are disposed on the outer surfaces of stub connectors 13 and 14 in order to more securely hold the open ends of conduits 17 that are applied reciprocally thereabout. When a sprinkler system is being assembled, some lubricating type medium will be applied to facilitate the attainment of a secure engagement between the conduit and the stub connector for the sprinkler system component 11. Once installed the interfitted components are quite secure in and of themselves. Usually the interfit is itself tight enough to withstand the hydraulic pressures usually encountered in a sprinkler system. For some installations an improved joinder is obtained through the use of cementing adhesives and/or the application of external clamps. Once a junction of this type has been made it is quite difficult to remove the conduit 17 from the stub connectors. When the standpipe 12 is still attached, a more aggressive pulling and pushing may be applied, but it is still sometimes difficult to remove the conduits from the sprinkler components.

A special problem arises in connection with the installation, usage or repair of already installed sprinkler systems. Because of loads that may be externally applied directly to the sprinkler component or by reason of loadings applied to the soil surrounding the sprinkler system or concuit, the connector stubs of the sprinkler components are often broken in the area indicated by the letter A. When the sprinkler component is broken, it is necessary to replace such component in order to return the system to usage. The presence of a broken stub 14 in the fluid conduit 17 presents a special problem, since the stub must be removed if the total length of the conduit is not to be shortened. At present brute strength and common hand tools, such as pliers and screw drivers, are being used to accomplish removal of such broken stubs. This procedure or even the slitting and notching of the broken stub component is unsatifsfactory from the standpoint of the labor costs involved and the potential end result. The required stub removal is in truth a quite disagreeable job when present conventional tools are used. In order to avoid damage to the installed conduit and further to provide an improved potential for a successful completion of operations, the present invention provides tool embodiments that can be used to facilitate stub removal operations.

A first embodiment of the invention is shown in FIG. 2. Here an extractor type of plier 21 is provided. The opposed handles 22 and 23 are joined together by a pivot 24 in such manner that a gripping pressure exerted against the handles causes an outward movement of the jaw components 26 and 27. These jaws and the respective end flanges 28 and 29 are of a size so that the jaws inclusive of the flanges may be inserted

through the flow passage 31 of broken stub connectors. Once the jaws are inserted through the broken end of the stub connector to a point where the flanges will be engaged behind the terminal ends 32 of such stub, a gripping pressure exerted on the handles will move the jaws outwardly to a position of engagement with the interior surface 33 of the flow passage 31. In order to increase the holding force that may be exerted against the broken stub, the external faces of the jaws 26 and 27 are provided with a plurality of raised points 34 that will bite into the surface of the broken stub. Such raised points may be separately cast or cut on the external jaw faces as shown. These gripping points or serrations which provide a mechanical tooth can be derived by knurling the exterior surface of the jaws or a file tooth cutting type of operation can be used. However derived, it is desirable that the exterior faces of the jaws present an aggressive toothed configuration in order to improve the gripping force that can be exerted by such jaws.

In the use of this FIG. 2 embodiment of the invention the hand gripping pressure exerted against the handles allows the teeth 34 on the jaws 26 and 27 to be securely engaged to the inner surface 33 of the stub while the flanges 28 and 29 are engaged against the innermost shoulder or terminal end 32 of such stub. When thus engaged a twisting and pulling force exerted against the stub will facilitate the extraction thereof.

A second embodiment of the invention is shown in FIG. 4. Here the desirable stub extraction is accomplished through use of a screw type puller mechanism. The combined puller tool 41 includes a mounting body 42 that threadedly receives a screw thread 43. Such screw will move reciprocally when rotated by cross-handle 44. The screw thread 43 is itself connected to an end plug 46 which rotates freely with respect to the screw but moves reciprocally with the end of such screw thread. Separate wings of an expansion extractor component 47 and 48 are pivotally secured together by pins 49 while the wings are urged apart by an expansion spring 51. When the tool is to be used, the wings 47 and 48 will be moved inwardly toward each other so that the flanges 52 provided on the separate wings can be introduced through the central bore 31 of a broken stub 13. When the wings have been inserted a required distance, the spring 51 will cause the flanges 52 to move outwardly to a position where the inwardly disposed terminal end 32 of the broken stub may be engaged by the flanges 52. Thereafter turning movement of the screw thread 43 will cause the end plug 46 to be brought into engagement with the flanges 52 whereby continued rotation of the screw will exert a pressure against the broken stub 13. This force is resisted by a shoulder 53 on the inner surface of the mounting body 42 which engages the end of the conduit 17. The applied leverage force of the screw system that is resisted by the shoulder 53 and mounting body 42 will accomplish the extraction of the broken stub 13 which will gradually move into a chamber 54 provided by the mounting body 42.

A further embodiment of the invention is shown in FIGS. 5 and 6. Here a plier type component is again used as a source of leverage force that is to be applied for separating the conduit and a broken stub or alternately for separating the conduit from an undamaged sprinkler component 11. If the tool is to be used for the extraction of broken stubs, one leg 67 of the plier extractor 61 can be joined to an internal extractor component that may be identical with the wings 47 and 48 and end plug 46 combination of FIG. 4. A tension rod 73 used in place of screw thread 43 can in this configuration be joined to a clevis 74 for interconnection to the leg 67 by a pin 76. These components will provide a pulling force that is to be resisted by a split external collar 77 which acts together with gripping jaws 78 and 79 to engage the exterior surface 81 of the conduit 17. The collar 77 and the cooperative grips 78 and 79 are engaged about the conduit 17 at a position past the terminal end 32 of any broken stub. The collar 77 itself has clevis type fingers 82 to facilitate interconnection of the collar to the other leg 66 of the extractor pliers 61 as by use of a pin 83. With this arrangement a gripping force exerted against the handles 62 and 63 will cause the legs 66 and 67 to be moved one away from the other. As the leg 66 is moved, the collar 77 will move reciprocally along the exterior surface of the conduit 17, and an internal wedging face 84 of the collar will engage the exterior surfaces of the gripping jaws 78 and 79. The resultant wedging action causes the jaws 78 and 79 to be moved into closer engagement with the exterior surface 81 of the conduit 17. The internal surfaces 86 of the jaws 78 and 79 are scored to provide a mechanical tooth for effectively gripping the conduit 17 as necessary to pull the conduit away from any entrapped broken stub. End flanges 87 are provided on the jaws 78 and 79 to limit the travel of the collar 77 so that the conduit 17 will not be overly compressed. The collar 77 can be of full circle construction, but it is preferred that such collar be of only segmental construction as better shown in FIG. 6. Where the opening left by a segmental construction is of sufficient width, the collar can be placed about a continuous conduit so that the tool can then be used for the disassembly of undamaged sprinkler system components. If this tool with a split or segmental collar is to be used for such disassembly operations, the jaw 78 will be positioned on the conduit; the collar 77 can then be moved from a lateral position to encompass the conduit; and thereafter the jaw 79, which is of sufficient arcuate extent to span the gap 88 in collar 77, can be moved reciprocally along the conduit 17 toward engagement with the wedge surface 84 provided by the collar 77. With both jaws and collar 77 in place and attached to the leg 66, an end or other portion of leg 67 can be abutted against a surface of an undamaged sprinkler system component to provide an anchor or base for the subsequent tensioning operations of the collar 77. In the FIG. 1 illustration the leg 67 could be positioned against the standpipe section 12 of the component 11, and the leverage force of pliers 61 would then be operative to mojve the engaged conduit 17 reciprocally away from such component 11.

A modification of the tool shown in FIG. 4 is possible so that an extractor plier leverage system may be used in connection with this shouldered type of device. If the mounting body 42 is terminated along the line B—B, clevis fingers 92, as shown by the dotted outline presentation, can be attached thereto. The extractor pliers 61 of FIG. 5 could then be interconnected to such clevis fingers 92 and to a clevis 93 attached to the shaft 43. With this alternate arrangement the leverage force of the extractor pliers 61 would be used in place of the screw thread 43 to pull the extractor components and an engaged broken stub 13 reciprocally apart from the

conduit. Such extracting movement will again be resisted by a shoulder **53.**

I claim:

1. A tool for extracting sprinkler system components from positions of engagement in conduits thereof comprising paired expansion extractor element jaws for insertion through the bore of said sprinkler system components, mechanical tooth elements on exterior surfaces of said expansion extractor element jaws positioned for contact along the secure engagement with the inner bore of said sprinkler system component, end flanges of said expansion extractor elements disposed substantially at right angles to said jaws and teeth for engagement behind the inwardly disposed terminal end of in-place sprinkler system components, and mechanical advantage means operative with said expansion extractor elements for moving said expansion extractor elements radially into engagement with the inner bore of said sprinkler system components. a collar for engagement about the exterior surface of said conduit, conduit engaging pieces for disposition about said conduit and within said collar, contraction means operative between said collar and conduit engaging pieces for moving said pieces toward secure contact with said conduit, and mechanical advantage means operative between said sprinkler system component and collar for facilitating the removal of said components reciprocally away from said conduit.

2. Structure as set forth in claim **1** wherein said collar is split to provide a gap whereby the collar can be applied laterally to partially encircle said conduit.

3. Structure as set forth in claim **1** and further comprising an expansion plier leverage component as said mechanical advantage means.

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