United States Patent

Davidson et al.

[15] **3,675,721**

[45] **July 11, 1972**

[54] FIRE FIGHTING APPARATUS WITH TELESCOPING BOOM

[72] Inventors: **Kenneth H. Davidson; Carrol V. Morris,** both of St. Joseph, Mo.

[73] Assignee: **Snorkel Fire Equipment Company**

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[21] Appl. No.: **83,925**

[52] **U.S. Cl.** **169/24,** 169/25, 239/165

[51] **Int. Cl.** **A62c 27/00**

[58] **Field of Search** 169/24, 25; 239/165, 281; 182/51, 52

[56] **References Cited**

UNITED STATES PATENTS

2,265,063	12/1941	Crumly	239/165 X
440,026	11/1890	Gathright	182/52
546,627	9/1895	Steck	169/25
383,699	5/1888	Bruegger, Jr.	169/25
423,135	3/1890	Crippen	169/25
3,206,126	9/1965	Thompson	169/25 X
3,074,649	1/1963	Atkinson	239/281 X

Primary Examiner—M. Henson Wood, Jr.

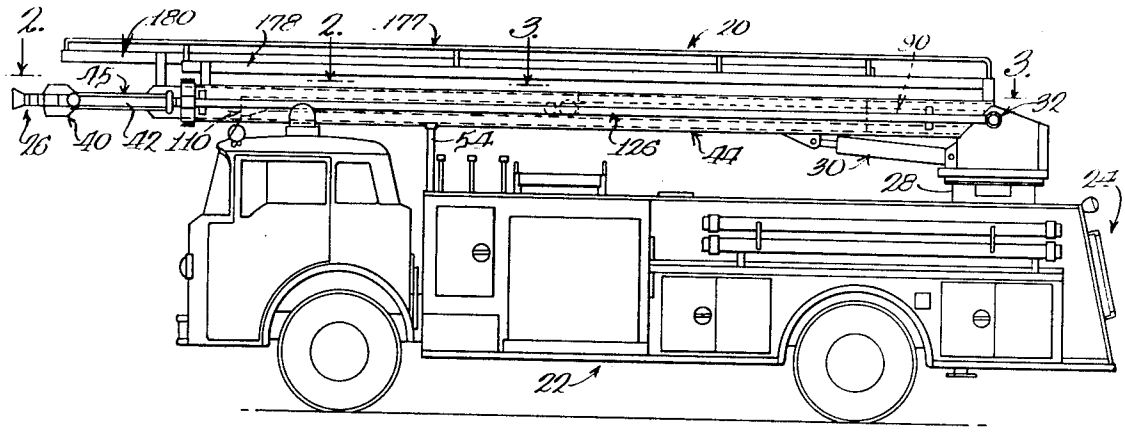
Assistant Examiner—John J. Love

Attorney—Dressler, Goldsmith, Clement & Gordon

[57] **ABSTRACT**

A telescoping boom is disclosed in combination with a pumper truck. The boom sections are hollow tubular members, and floating guide shoes mount the outer boom section for movement relative to the inner boom section. A nozzle is provided at the end of the outer boom section, and telescoping conduit sections are secured in external relationship to be boom for conveying water to the nozzle. Primary control means is provided at the rear of the truck for remotely controlling the boom and nozzle. Hydraulically actuated cable means are connected between the boom sections for extension and retraction of the outer boom section. Secondary control means is provided adjacent the end of the outer boom section for the nozzle, and a telescoping ladder is associated with the boom to provide access to the secondary control means. The telescoping ladder also enables a fireman to carry out normal fire fighting and rescue activities in elevated and difficult to reach positions. A flexible electrical cable and flexible hydraulic conduits are mounted within the boom structure for providing power to the control means at the end of the outer boom section, and the cable and conduits are movable as the outer boom section is extended.

11 Claims, 11 Drawing Figures



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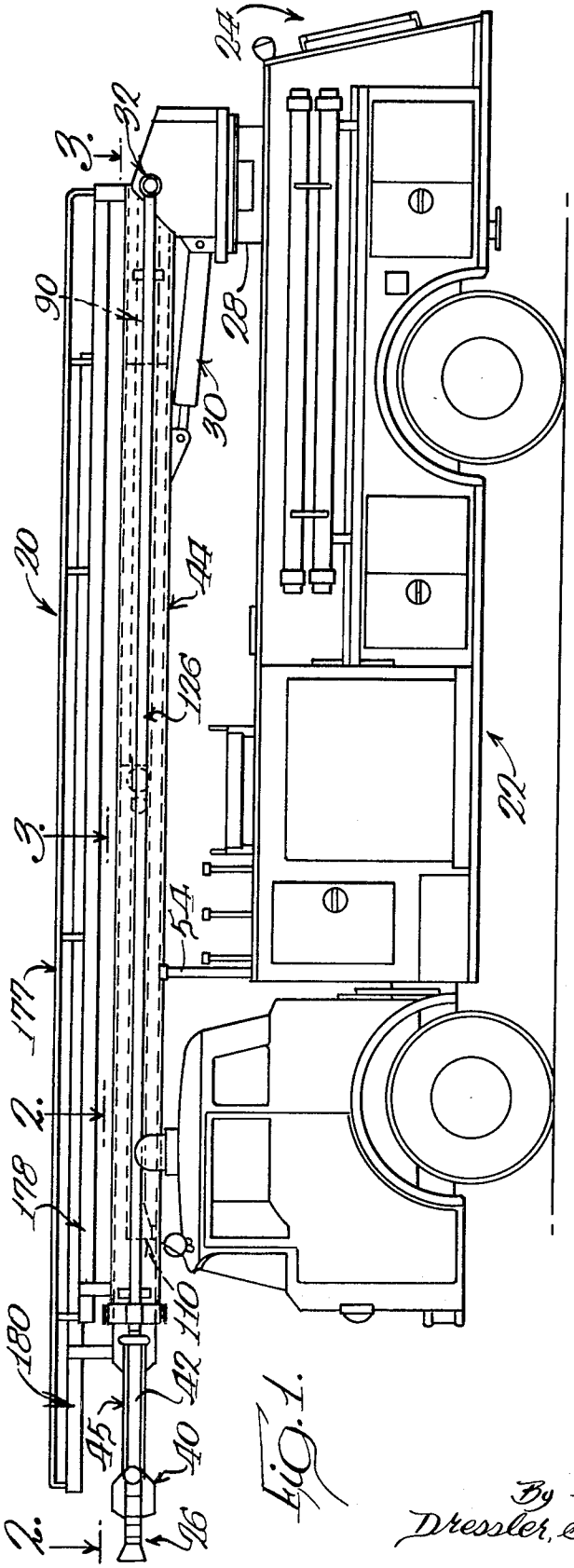

FIG. 1.

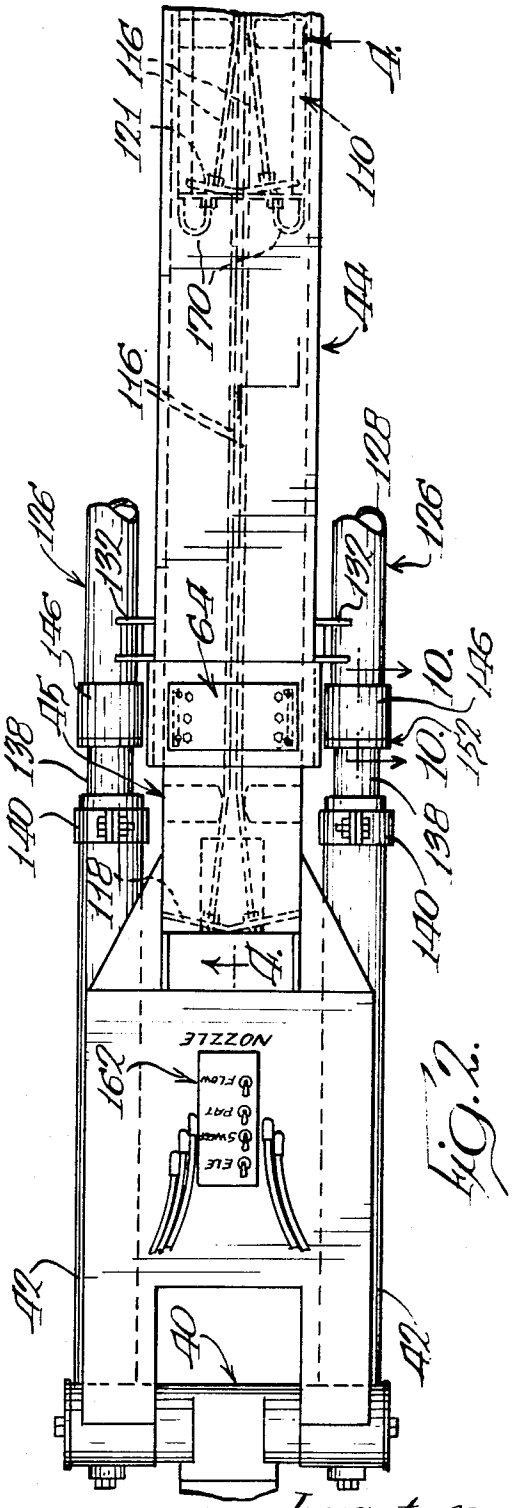

FIG. 2.

Inventors:
Carrol V. Morris
By Kenneth H. Davidson
Dressler, Goldsmith, Clement & Gordon
Attys

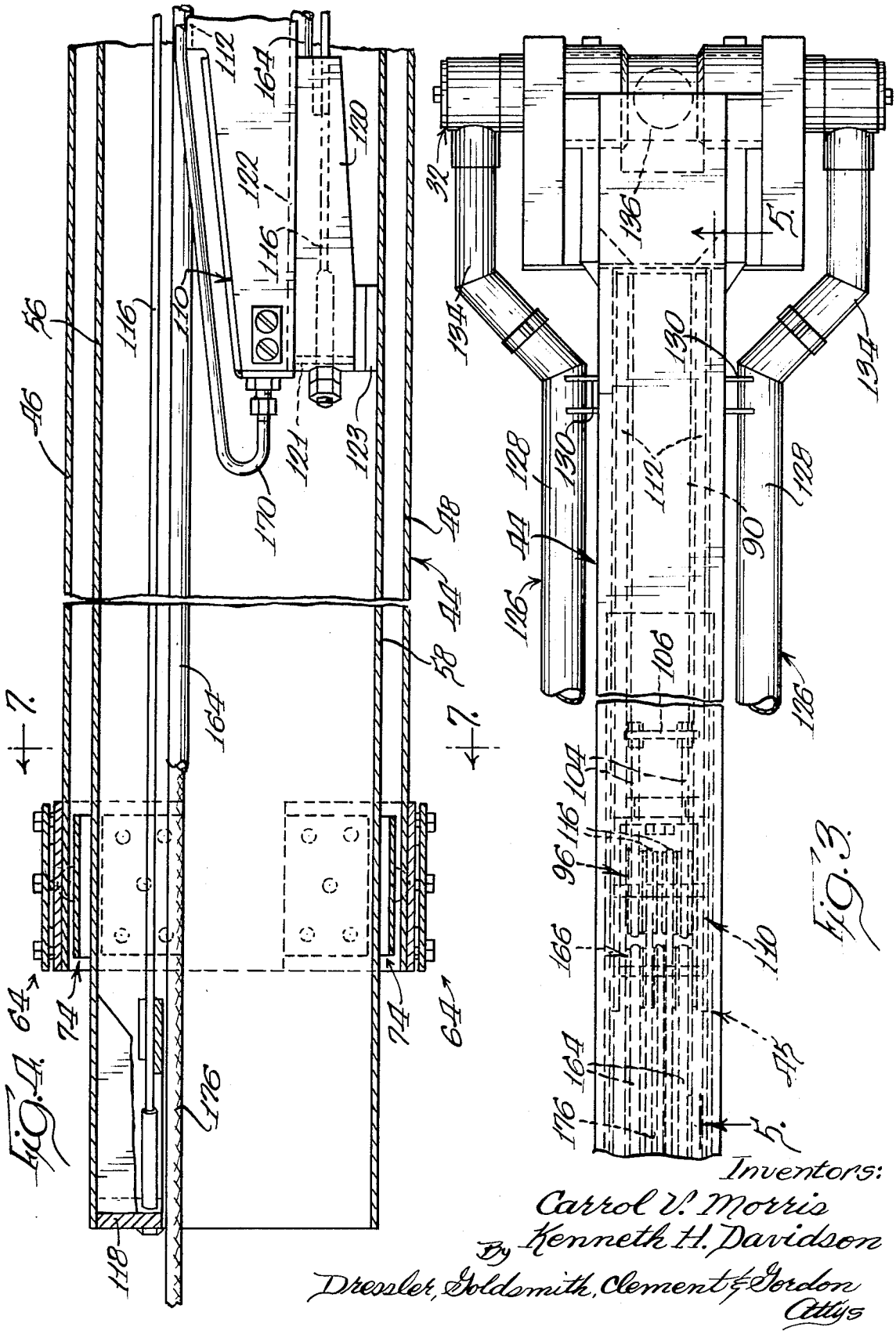

FIG. 4.

FIG. 3.

Inventors:
Carrol V. Morris
Kenneth H. Davidson
By Dressler, Goldsmith, Clement & Gordon
Attys

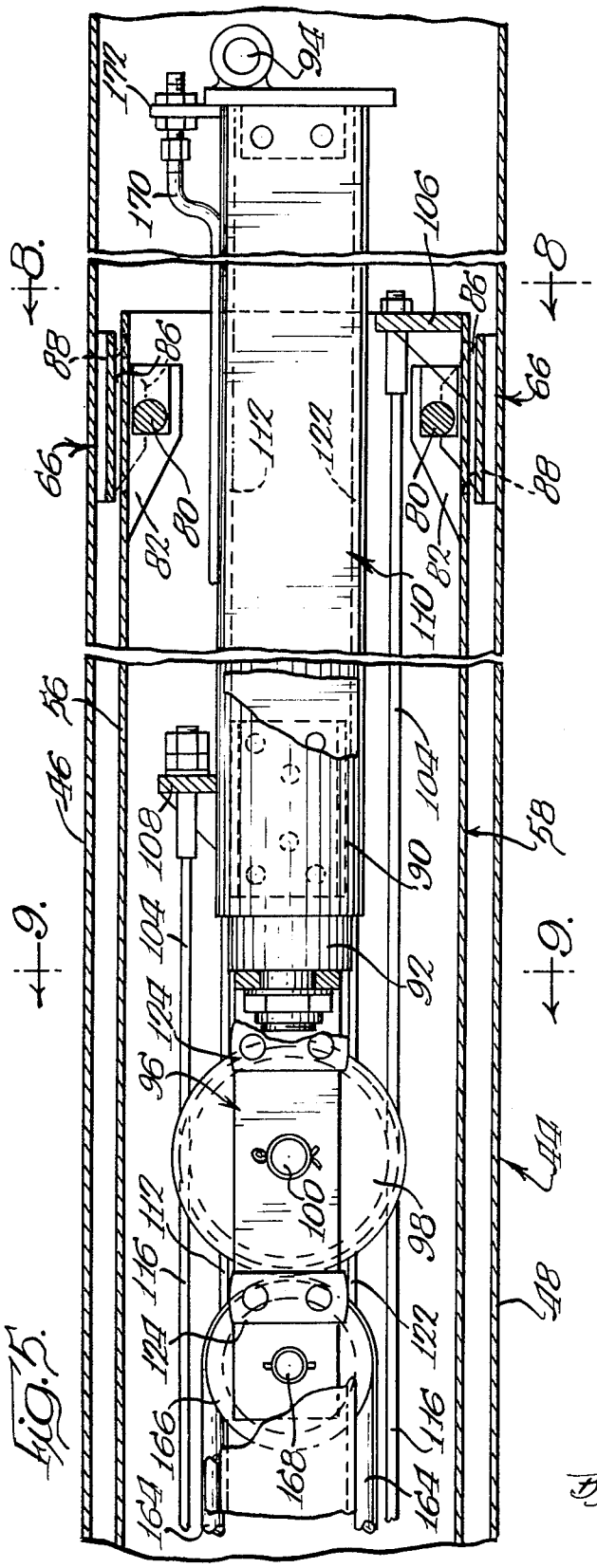

Fig. 5.

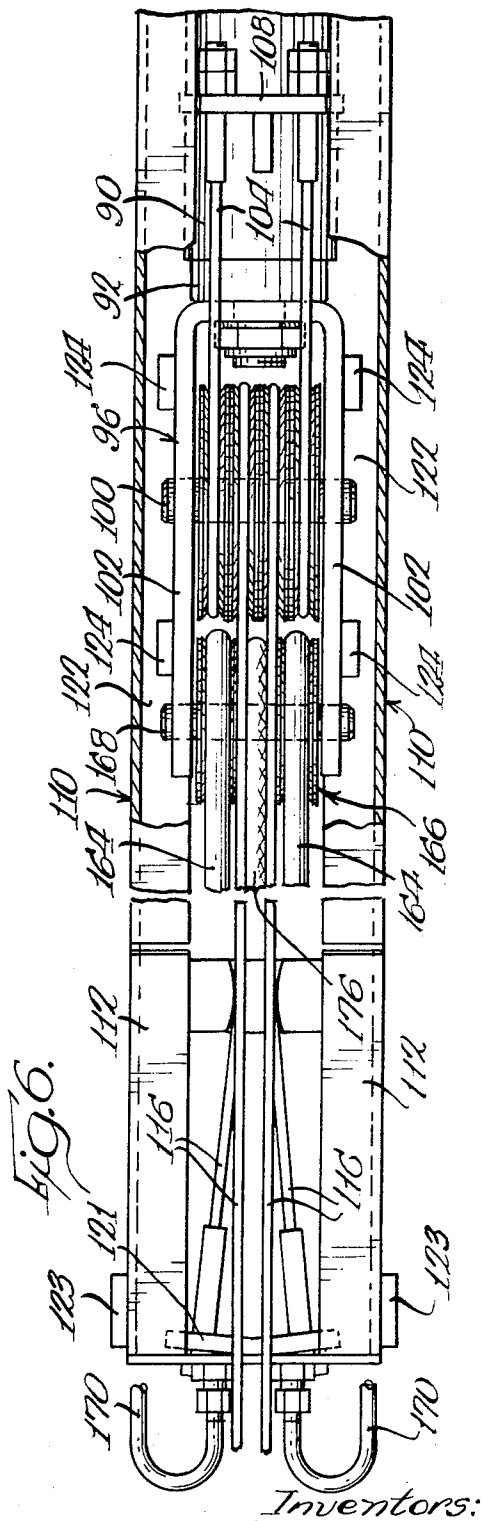

Fig. 6.

Inventors:
Carrol V. Morris
Kenneth H. Davidson
By Dressler, Goldsmith, Clement & Gordon Attys

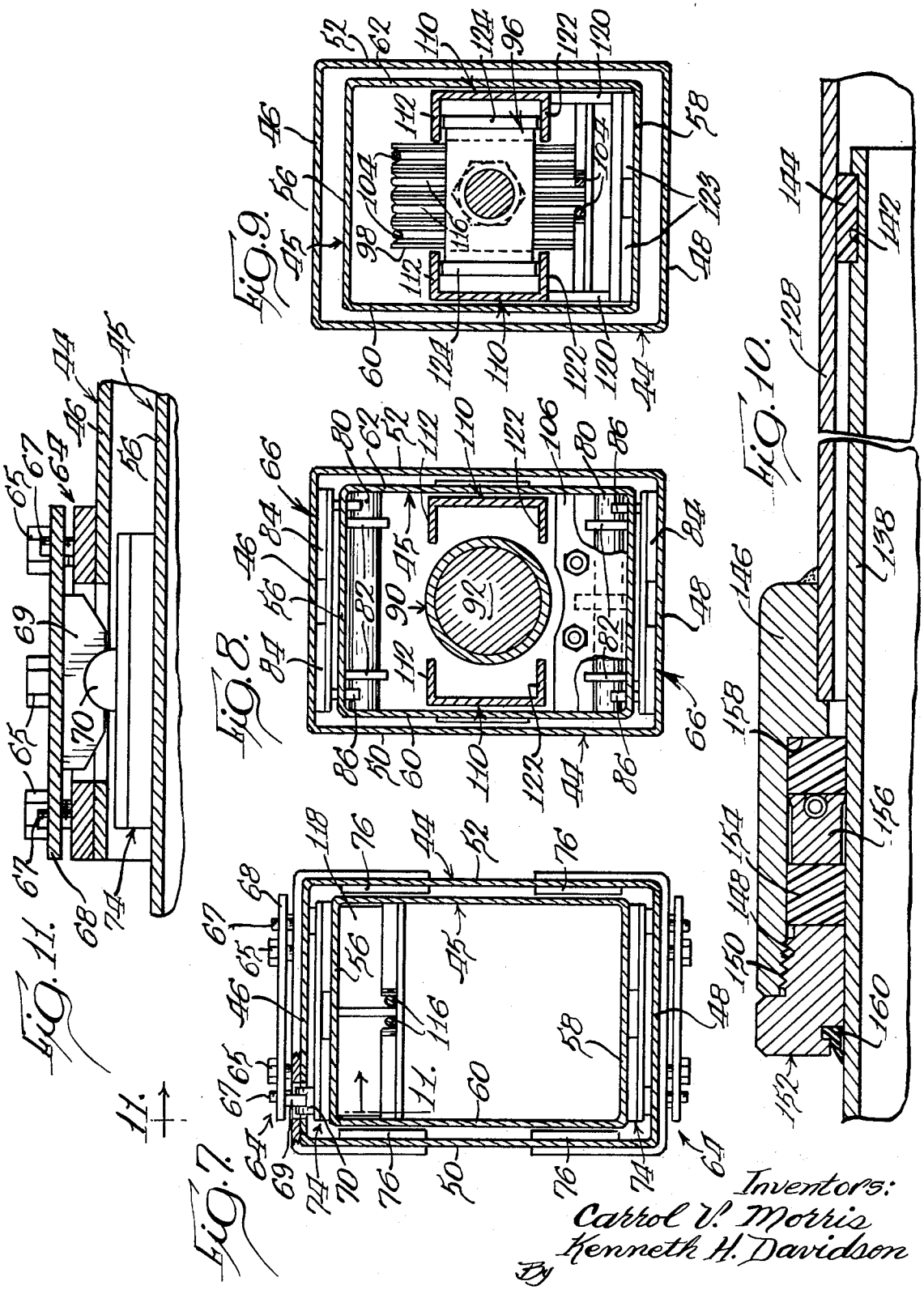

Fig. 7.

Fig. 8.

Fig. 9.

Fig. 10.

Fig. 11.

Inventors:
Carrol V. Morris
Kenneth H. Davidson
By
Dressler, Goldsmith, Clement & Gordon
Attys

FIRE FIGHTING APPARATUS WITH TELESCOPING BOOM

BACKGROUND OF THE INVENTION

Multiple section booms have been utilized in the past in connection with fire fighting apparatus and an arrangement that has met with wide commercial acceptance in illustrated in Moore et al. U.S. Pat. No. 3,346,052. The boom structure illustrated in the Moore et al. relative consists of a pair of pivotally connected boom sections and two hydraulic cylinders are provided for movement of the boom sections from a road-ready position to an extended position. The first hydraulic cylinder is connected to the inner boom section for pivoting the same about a horizontal axis, while the second hydraulic cylinder is connected between the boom sections to pivot the outer boom section relative to the inner boom section. While such folding boom sections have functioned satisfactorily, there has been a long felt need for an alternate boom structure that possessed the advantages of an articulated boom structure, i.e., the capability of extension to remote areas while maintaining a compact road-ready position, and heretofore satisfactory alternatives to articulating boom structures have not been provided for fire fighting apparatus.

Those skilled in the art have recognized for some time the desirability of providing a pumper truck or the like with a telescoping boom structure, but heretofore such a combination has not been effected due at least partially to problems arising from providing water under pressure to the nozzle at the end of the outer boom section. The problems in providing a telescoping boom for fire fighting equipment is also compounded when it is desired to have controls at the outer end of the boom for controlling the nozzle, since this requires the provision of means for supplying hydraulic and electric power to the control means, as well as providing manual access thereto.

BRIEF SUMMARY OF THE INVENTION

The present invention obviates the problems noted above by providing fire fighting apparatus with a telescoping boom structure in combination with a telescoping conduit structure for supplying water under pressure to the nozzle at the end of the outer boom section. The conduit means is comprised of a pair of slidably mounted tubular members that are mounted externally of the boom, with one conduit member being secured to the inner boom section, and the other conduit member being secured to the outer boom section for movement therewith. Positive sealing means are provided for preventing leakage regardless of the position of one conduit member relative to the other conduit member.

The present invention also includes novel means for guiding the outer boom section relative to the inner boom section, and the guide means includes a plurality of floating guide members that assure free movement of the outer boom section relative to the inner boom section regardless of irregularities therein. The retraction means for the outer boom section relative to the inner hydraulically actuated cable system which provides for reliable extension and retraction of the outer boom section.

In a preferred embodiment of the invention, control means are provided adjacent the outer end of the outer boom section, so that the nozzle on the outer boom section can be directly, rather than remotely, controlled. In the preferred embodiment, a telescoping ladder is associated with the boom structure, so that a fireman can readily reach remote areas to perform normal fire fighting and rescue activities, and to have access to the control means at the end of the boom.

The telescoping boom structure of the present invention contains many advantages not attainable with prior art articulated boom structures. For example, since the movement of the boom is rectilinearly, instead of arcuate, the boom can more easily be manipulated into confined areas. This is particularly important in fighting a fire in areas where power wires are present. A further advantage that inures from the rectilinear movement is that the nozzle at the end of the outer boom section can be easily inserted through a confined opening in a building, such as a window. The boom structure of the present invention can be moved from a position pointing straight up to a position below the horizontal, which is important, for example, when it is desired to direct water back toward the pumper truck, as for example in extinguishing a fire below a dock.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. **1** is a side elevational view of the fire fighting apparatus of the present invention with the telescoping boom section in a travel position;

FIG. **2** is an enlarged view of the outer boom section taken generally along line **2—2** of FIG. **1**;

FIG. **3** is a broken, enlarged plan view of the inner end of the boom structure taken generally along line **3—3** of FIG. **1**;

FIG. **4** is an enlarged sectional view taken generally along line **4—4** of FIG. **2**;

FIG. **5** is an enlarged sectional view taken generally along line **5—5** of FIG. **3**;

FIG. **6** is an enlarged plan view illustrating the structure adjacent the outer end of the inner boom section, with certain portions broken away for clarity of illustration;

FIG. **7** is a sectional view taken generally along line **7—7** of FIG. **4**;

FIG. **8** is a sectional view taken generally along line **8—8** of FIG. **5**;

FIG. **9** is a sectional view taken generally along line **9—9** of FIG. **5**;

FIG. **10** is an enlarged sectional view taken along line **10—10** of FIG. **2**; and

FIG. **11** is a sectional view taken generally along line **11—11** of FIG. **7**.

DETAILED DESCRIPTION

While this invention is susceptible of embodiment in many different forms, there is shown in the drawings and will herein be described in detail a preferred embodiment of the invention, with the understanding that the present disclosure is to be considered as an exemplification of the principles of the invention and is not intended to limit the invention to the embodiment illustrated. The scope of the invention will be pointed out in the appended claims.

Referring now to the drawings, the boom structure of the present invention is illustrated in its entirety at **20** in FIG. **1**, and the boom structure is illustrated in a retracted position in FIG. **1** on a mobile frame in the form of a pumper truck **22**. The pumper truck **22** is essentially of conventional design and includes a control panel **24** at a pedestal at the back of the truck where a fireman can remotely control the boom structure **20** and the nozzle **26** at the end of the boom structure for discharging a controlled spray of water on to a fire. A turntable **28** is provided at the rearward end of the pumper truck **22**, and supports the boom **20** for pivotal movement about a vertical axis. Turntable structure **28** is essentially the same as that disclosed in commonly assigned Moore et al. U.S. Pat. No. 3,346,052 and in the commonly assigned copending Davidson et al. application Ser. No. 788,200 filed Dec. 31, 1968.

As is explained in said patent and said application, hydraulic cylinder means **30** is provided for pivoting boom **20** about a horizontal axis **32** on turntable assembly **28**. As is also explained in said application, a monitor assembly **40** at the outer end of the boom **20** provides a support for the nozzle means **26**, and a pair of hollow conduit portions **42** communicate with the monitor assembly for conveying first and second supplies of water to the nozzle means **26**.

The boom structure **20** of the present invention comprises a plurality of telescopically arranged boom sections, and in the specific embodiment disclosed herein, the boom **20** includes an inner boom section **44** and an outer boom section **45**,

although the boom 20 can include additional sections, if it is desired to increase the reach thereof. As can be best seen in FIGS. 7–9, inner boom section 44 is a hollow rectangular member including spaced parallel top and bottom walls 46 and 48, respectively, and spaced parallel side walls 50 and 52. The innermost end of inner boom section 44 is mounted for pivotal movement about horizontal axis 32, and an upwardly extending support 54 is provided on the pumper truck 22 rearwardly of the cab thereof to support the boom structure in the transport position.

Outer boom section 45 is also a hollow rectangular member that includes spaced parallel top and bottom walls 56 and 58, respectively, and spaced parallel side walls 60 and 62. Guide means 64 (FIGS. 4, 7 and 11) is provided adjacent the outer end of inner boom member 44 for guiding the outer boom section 45, while further guide means 66 (FIGS. 5 and 8) is provided adjacent the inner end of the outer boom section 45.

Each guide means 64 includes a central support plate 68 with the upper central support plate 68 being secured in spaced relationship with respect to the top surface 46 of the inner boom section and with the lower support plate 68 being secured in spaced relationship with respect to the bottom 48 of the inner boom section. Plates 68 are secured to boom section 44 by a plurality of bolts 65, and further bolts 67 are threaded into openings in the plates 68 so that the spacing of the plates relative to the boom 44 can be adjusted. Concave supports 69 are carried on plates 68, mating with convex supports 70 that extend outwardly from guide shoes 74 to mount the guide shoes for rocking movement. Guide means 64 function to guide the outer boom member 45 relative to the inner boom member 44, even though there may be irregularities in the top 56 and bottom 58 of the outer boom member, since guide shoes 74 are free to rock about the axis provided by supports 70. Upright guide members 76 are preferably secured to the side walls 50 and 52 of the inner boom member 44 to engage the side walls 60 and 62 of the outer boom member 45, so that the outer boom member is positively guided as it moves relative to the inner boom member.

Guide means 66 are similar to guide means 64, and include a transversely extending pin 80 that is secured to the side walls 60 and 62 of the outer boom section 45 adjacent the inner end thereof. Pin 80 is supported by brackets 82 that are secured to the top wall 56 and bottom wall 58 of the outer boom section. Guide shoes 84 are positioned in sliding engagement with the inner surfaces of the top wall 46 and the bottom wall 48 of the inner boom section, and arms 86 extend outwardly from guide shoes 84 through enlarged openings 88 (FIG. 5) in the top and bottom walls of the outer boom section. Arms 86 include arcuate recesses that are mounted on pin 80, so that each of the guide means 66 is floatingly mounted in a manner similar to guide means 64.

The means for moving the outer boom section 45 relative to the inner boom section 44 includes a hydraulic cylinder 90 (FIG. 5) having a fluid powered ram 92 mounted for axial movement relative thereto. Cylinder 90 is a double acting cylinder, so that ram 92 is powered in both directions. The head end of the cylinder is mounted upon a pin 94 that extends transversely between the sides 50 and 52 of the inner boom section 44. A yoke 96 is secured to the outer end of ram 92, and sheaves 98 are rotatably mounted on a pin 100 that extends transversely between the arms 102 of yoke 96.

First cable means is provided for moving the outer boom section 45 outwardly relative to the inner boom section 44 when the ram 92 moves outwardly, and the first cable means includes a pair of spaced, parallel cables 104 that are secured at one end to a bracket 106 that extends upwardly from the inner end of the bottom wall 58 of the outer boom section 45. Cables 104 extend forwardly as shown in FIG. 5 and are trained up and around sheave 98 where the opposite ends of the cable are secured to a bracket 108 that is secured to the top of hydraulic cylinder 90.

A second cable means is provided for retracting the outer boom section 45 when ram 92 is retracted, or moved to the right as viewed in FIG. 5, and the second cable means includes a pair of laterally spaced, parallel cables 116 that are each connected adjacent one end to brackets 118 extending downwardly from the top wall 56 of the outer boom section 45. The intermediate portions of cables 116 are trained over sheave 98, and the opposite ends of cables 116 are secured to a plate 121 that is fixed between brackets 120 that extend downwardly from the lower flange 122 of guide members 110 that are bolted, or otherwise suitably secured, to the side walls 50 and 52 of the inner boom section 45. Thus, as ram 92 is retracted, cables 116 pull outer boom section 45 into the retracted position shown in FIGS. 4 and 5. A guide shoe 123 is secured to the lower end of guide members 110 adjacent the forward end thereof to support the guide members 110 as the outer boom section 45 moves relative thereto. Guide blocks 124 are secured to the outer surfaces of the spaced arms 102 of yoke 96, and the guide blocks are mounted for sliding movement between the flanges 112 and 122 of guide members 110 to support the yoke 96 during extension and retraction of ram 92.

Generally identical conduit means 126 are provided for supplying water under pressure to the spaced conduits 42 connected to the monitor assembly 40. Each conduit means 126 includes a first tubular member 128 that is secured to a side wall of inner boom section 44 by spaced brackets 130 (FIG. 3) and 132 (FIG. 2). The right-hand end of conduit members 128 are connected by elbows 134 to pivot assembly 32 to receive water under pressure from a vertical pipe 136, and the passage means establishing communication between pipe 136 and elbows 134 can be understood by reference to the above-mentioned Davidson et al. application.

Conduit means 126 each further include second tubular members 138 that are each slidably received in one of tubular members 128. Conduit members 138 are fixedly secured in fluid communication with monitor conduits 42 by clamping means 140 so that the conduit members 138 move with the outer boom section 45 during extension and retraction thereof. Each tubular member 138 is retained in fluid tight sliding engagement within a tubular member 128 by structure that can be best seen from FIG. 10. As shown therein, an annular recess 142 is provided adjacent the right-hand end of tubular member 138, and a urethane bearing ring 144 is seated in recess 142 in sliding engagement with the inner surface of tubular member 128. A cup member 146 is secured to the outer end of tubular member 128, and the left-hand end of cup member 146 is internally threaded at 148 for reception of the externally threaded portion 150 of a retaining member 152. A pair of longitudinally spaced annular urethane bearing rings 154 are positioned between cup member 146 and the outer periphery of outer tubular member 138, and an annular flexible sealing member 156 is interposed between bearing rings 154. Cup member 146 includes an outwardly facing shoulder 158 against which one bearing ring 154 is seated. Seal 156 is positioned in fluid tight sealing engagement between the inner diameter of member 146 and the outer diameter of member 138, and retaining member 152 holds the rings 154 in assembled relationship. A wiper 160 is preferably seated in an annular recess in clamping member 152 in engagement with the outer periphery of tubular member 138. With the above described arrangement, a positive fluid tight seal is effected, with the structure providing support for the movable conduit member 138 at a plurality of axially spaced locations to positively guide the same during its movement relative to the fixed conduit member 128.

A control panel 162 (FIG. 2) is provided on the outer end of outer boom 45, so that the nozzle 26 of monitor 40 can be controlled by a fireman at the end of the boom structure 20 instead of remotely controlled from the rear pedestal 24. It should be understood that the control panel provides means for operating the nozzle 26 in the manner described in detail in the above mentioned Davidson et al. application. In order to get electric and hydraulic power to the control panel 162, a flexible electrical cable and flexible hydraulic conduits are

provided. The hydraulic conduits are in the form of a pair of flexible hose members **164** (FIGS. **5** and **6**) that are trained over a pulley **166** that is pivotally mounted on a pin **168** that extends transversely between the ends of yoke arms **102**. The lower reaches of hoses **164**, as viewed in FIG. **4**, are provided with hydraulic fluid under pressure from fixed conduits **170** that are connected to a bracket **172** adjacent the inner ends of guide members **110**. Conduits **170** receive fluid under pressure from a fluid source on the pumper truck **22**. The upper reaches of hoses **164** are connected directly to valving on the outer end of the outer boom section, associated with control panel **162**. The electric power is supplied to control panel **162** through wires in a flexible cable **176** (FIG. **4**). One end of cable **176** is connected to the control panel and the outer end is fixed to guide members **110**, with an intermediate portion of cable **176** being trained over pulley **166** (FIG. **6**). Thus, as ram **92** is extended, the outer boom section **45** pulls cables **176** and hoses **164** around pulley **166**, while during retraction of ram **92**, the cable **176** and hoses **164** are pulled to the storage position by pulley **166**.

In order to provide manual access to the control panel **162**, a telescoping ladder assembly **177** is mounted on boom **20**. The ladder includes an inner section **178** that is fixed to inner boom section **44**, and an outer section **180** that is secured to outer boom section **45** and which extends outwardly a distance sufficient to allow a fireman to easily manipulate the controls of panel **162**. The telescoping ladder assembly also enables a fireman to perform normal fire fighting and rescue activities in remote areas.

What is claimed is:

1. Fire fighting apparatus comprising a mobile frame, a boom structure mounted on said frame for pivotal movement about a horizontal axis and about a vertical axis, said boom structure including an inner hollow tubular boom section mounted on said frame for movement about said horizontal and vertical axes and an outer hollow tubular boom section mounted for telescopic movement within said inner boom section, nozzle means at the outer end of said outer boom section for discharging fluid, said nozzle means including first and second fluid inlets, a pair of conduit means externally mounted on said boom for conveying fluid to said nozzle means, each of said pair of conduit means including a first rigid tubular conduit section externally secured to said inner boom section and a rigid tubular conduit section externally secured to said outer boom section and mounted for free sliding telescopic relationship within said first conduit section, sealing means between the confronting walls of said first and second sections for preventing fluid leakage, the outer ends of said second conduit sections each being in communication with one of said fluid inlets, manual control means mounted on said boom adjacent the outer end of said outer boom section for operating said nozzle means, ladder means on said boom structure providing access to said control means, said ladder means including a first section secured to said inner boom section and a second section secured to said outer boom section, and means completely enclosed within said boom structure for providing electrical and hydraulic power to said control means from said mobile frame.

2. Fire fighting apparatus comprising: a mobile frame; a boom mounted on said frame for pivotal movement about both a horizontal axis and a vertical axis, said boom including an inner boom section mounted on said frame and an outer boom section mounted for telescopic movement relative to said inner boom section; nozzle means at the outer end of said outer boom section for discharging fluid; and conduit means mounted on said boom for conveying fluid to said nozzle means, said conduit means including a first conduit section secured to said inner boom section and a second conduit section secured to said outer boom section and mounted in telescoping relationship with respect to said first conduit section, manual control means adjacent the outer end of said outer boom section for operating said nozzle means, ladder means on said boom providing access to said control means, said ladder means including a first section secured to said inner boom section and a second section secured to said outer boom section, means carried by said boom for providing electrical and hydraulic power to said control means, said power providing means being completely enclosed within said boom, said means for providing hydraulic power including at least one flexible hose having an outlet end connected to said control means and an inlet end secured to said inner boom section and connected to a source of hydraulic fluid under pressure, an intermediate portion of said hose being trained over a support that is movable with said outer boom section, whereby as said outer boom section is extended the hose section between said inlet end and said support is pulled around said support by said outer boom section, and as said outer boom section is retracted said support pulls against said hose to feed a portion of the section of the hose between the support and the outlet end to a storage position.

3. Fire fighting apparatus comprising: a mobile frame; a boom mounted on said frame for pivotal movement about both a horizontal axis and a vertical axis, said boom including an inner boom section mounted on said frame and an outer boom section mounted for telescopic movement relative to said inner boom section; nozzle means at the outer end of said outer boom section for discharging fluid; and conduit means mounted on said boom for conveying fluid to said nozzle means, said conduit means including a first conduit section secured to said inner boom section and a second conduit section secured to said outer boom section and mounted in telescoping relationship with respect to said first conduit section, manual control means adjacent the outer end of said outer boom section for operating said nozzle means, ladder means on said boom providing access to said control means, said ladder means including a first section secured to said inner boom section and a second section secured to said outer boom section, means carried by said boom for providing electrical and hydraulic power to said control means, said power providing means being completely enclosed within said boom, said means for providing electrical power including at least one flexible cable having one end connected to said control means and the other end secured to said inner boom section, an intermediate portion of said cable being trained over a support that is movable with said outer boom section, whereby as said outer boom section is extended the cable section between said other end and said support is pulled around said support by said outer boom section, and as said outer boom section is retracted said support pulls against said cable to feed a portion of the section of the cable between the support and said one end to a storage position.

4. Fire fighting apparatus as set forth in claim **3** wherein said means for providing hydraulic power includes at least one flexible hose having an outlet end connected to said control means and an inlet end secured to said inner boom section and connected to a source of hydraulic fluid under pressure, an intermediate portion of said hose being trained over said support, whereby as said outer boom section is extended the hose section between said inlet end and said support is pulled around said support by said outer boom section, and as said outer boom section is retracted said support pulls against said hose to feed a portion of the section of the hose between the support and the outlet end to a storage position.

5. Fire fighting apparatus as set forth in claim **4** wherein said support is a sheave associated with said outer boom section and which moves at half the speed of the outer boom section.

6. Fire fighting apparatus comprising: a mobile frame; a boom mounted on said frame for pivotal movement about both a horizontal axis and a vertical axis, said boom including an inner boom section mounted on said frame and an outer boom section mounted for telescopic movement relative to said inner boom section; nozzle means at the outer end of said outer boom section for discharging fluid; and conduit means mounted on said boom for conveying fluid to said nozzle means, said conduit means including a first conduit section secured to said inner boom section and a second conduit sec-

tion secured to said outer boom section and mounted in telescoping relationship with respect to said first conduit section, including extension means for extending and retracting said outer boom section relative to said inner boom section, said extension means including a first cable secured at one end to said outer boom section and secured at the outer end to said inner boom section, the intermediate portion of said cable being trained over a reaction member, said extension means further including a second cable secured at one end to said outer boom section on an opposite side of said reaction member than said first cable and secured at the other end to said inner boom section on an opposite side of said reaction member than said first cable, and means for shifting said reaction member outwardly relative to said inner boom section whereby said first cable pulls said outer boom section outwardly and for shifting said reaction member inwardly whereby said second cable pulls said outer boom section inwardly.

7. Fire fighting apparatus as set forth in claim 6 wherein said means for shifting said reaction member is a fluid ram.

8. Fire fighting apparatus as set forth in claim 6 wherein said inner boom section is a hollow member having said outer boom section nested therewithin, with support means being interposed between said boom sections to guide said outer boom section as it moves relative to said inner boom section.

9. Fire fighting apparatus as set forth in claim 8 in which said outer boom section is a hollow member, and wherein guide means is provided within said outer boom section for supporting said reaction member.

10. Fire fighting apparatus as set forth in claim 8 wherein said support means includes guide members floatingly mounted upon the top and bottom of said inner boom section, said floating members having guide shoes thereon engageable with the top and bottom of said inner boom section.

11. Fire fighting apparatus comprising a mobile frame, a boom structure mounted on said frame for pivotal movement about a horizontal axis and about a vertical axis, said boom structure including an inner hollow tubular boom section mounted on said frame for movement about said horizontal and vertical axes and an outer hollow tubular boom section mounted for telescopic movement within said inner boom section, nozzle means at the outer end of said outer boom section for discharging fluid, said nozzle means including a fluid inlet, conduit means mounted on said boom for conveying fluid to said nozzle means, said conduit means including a first rigid tubular conduit section secured to said inner boom section and a rigid tubular conduit section secured to said outer boom section and mounted for free sliding telescopic relationship within said first conduit section, sealing means between the confronting walls of said first and second conduit sections for preventing fluid leakage, the outer end of said second conduit section being in communication with said fluid inlet, manual control means mounted on said boom adjacent the outer end of said outer boom section for operating said nozzle means, ladder means on said boom structure providing access to said control means, said ladder means including a first section secured to said inner boom section and a second section secured to said outer boom section, and second manual control means on said mobile frame at the lower end of said inner boom section for operating said nozzle means.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,675,721 Dated July 11, 1972

Inventor(s) Kenneth H. Davidson and Carrol V. Morris

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

In the Abstract, line 6, "be" should be -- the --;

Col. 1, lines 57-58, after "section" delete "relative to the inner" and insert -- is a --;

Col. 5, line 17, "cables" should be -- cable --.

Signed and sealed this 31st day of October 1972.

(SEAL)
Attest:

EDWARD M.FLETCHER,JR.
Attesting Officer

ROBERT GOTTSCHALK
Commissioner of Patents