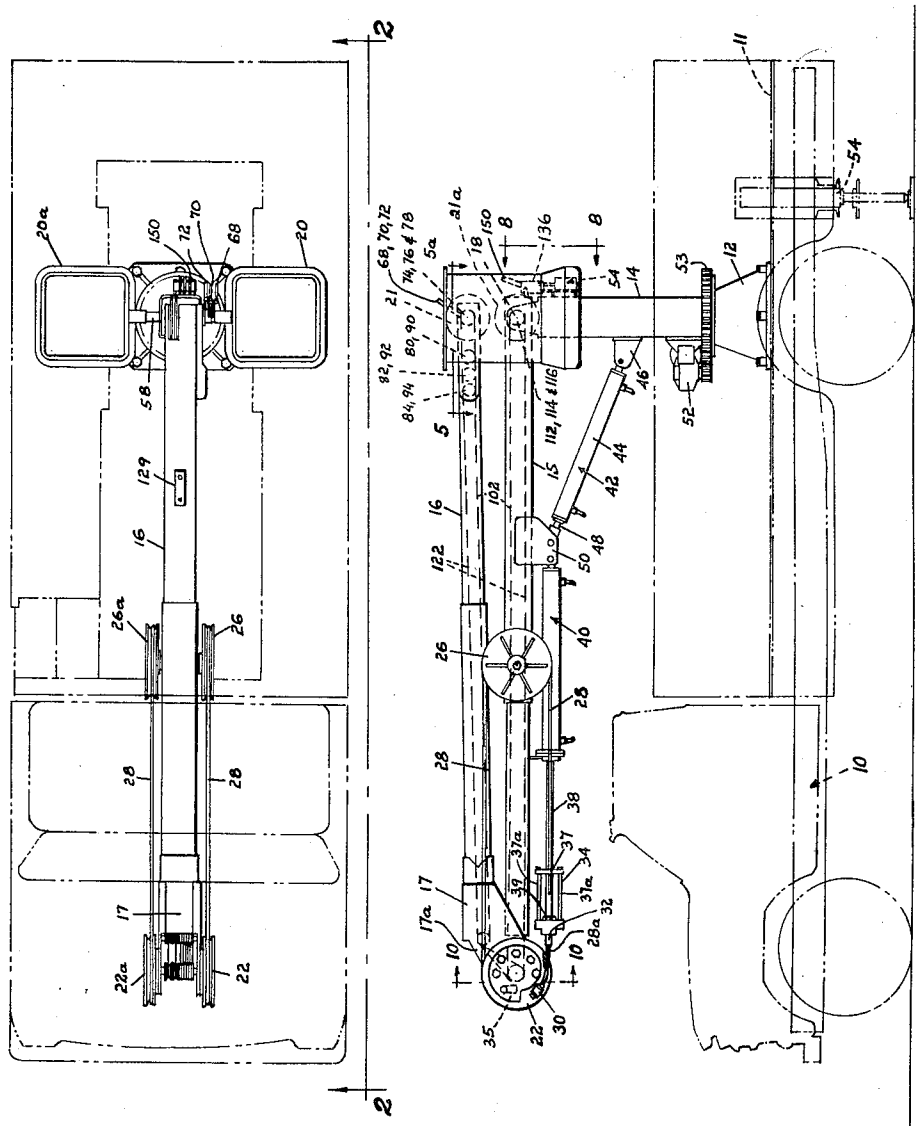
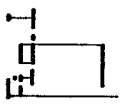
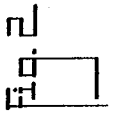
Dec. 1, 1959 H. J. TROCHE 2,915,137

MOBILE AERIAL TOWER

Filed May 5, 1958 8 Sheets-Sheet 1







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MOBILE AERIAL TOWER

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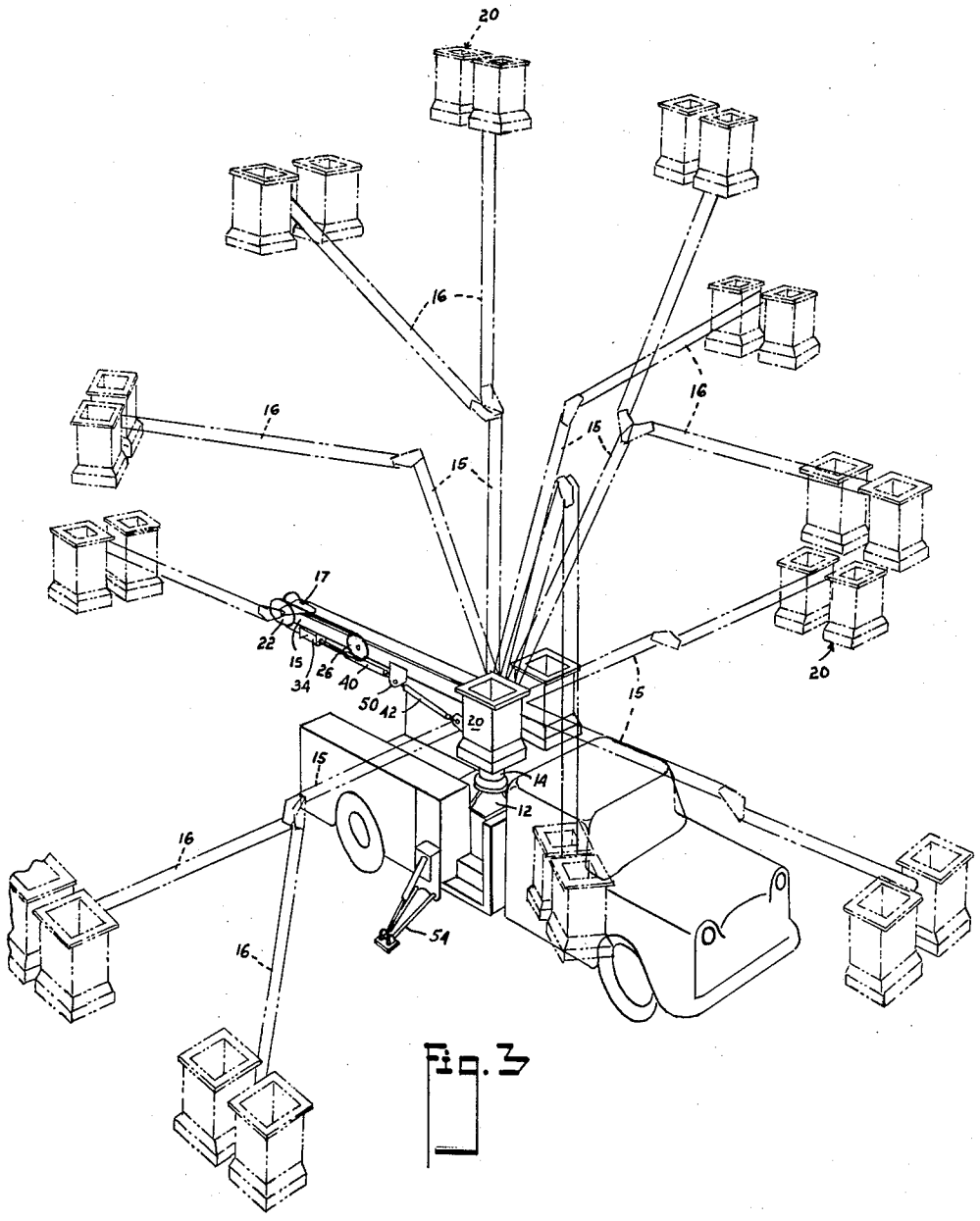


Fig. 3

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MOBILE AERIAL TOWER

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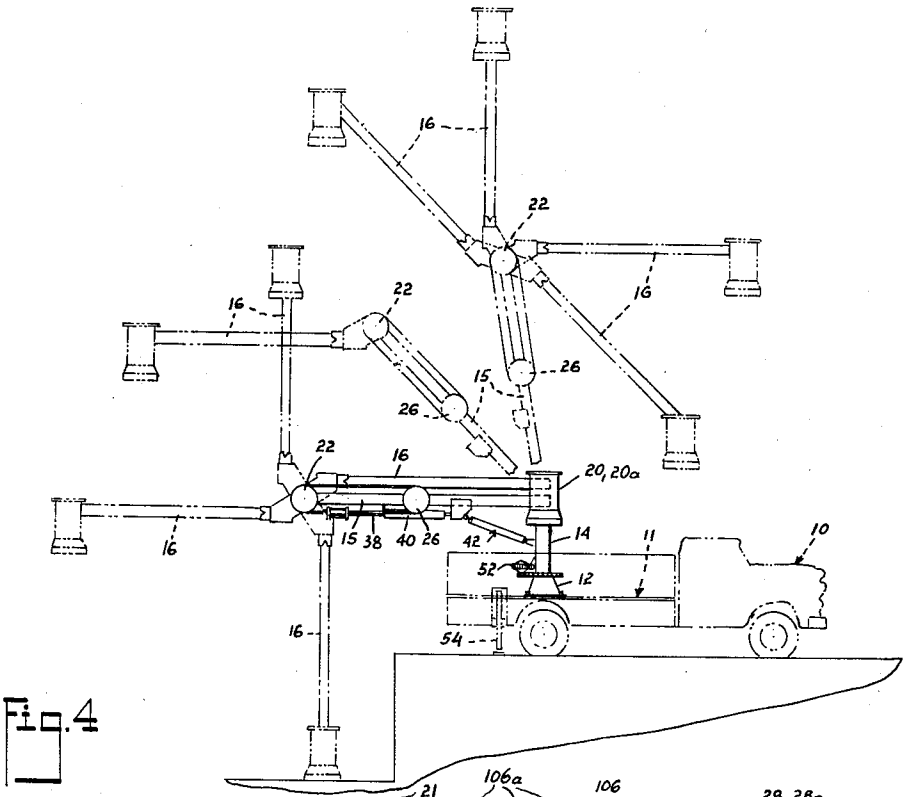


Fig. 4

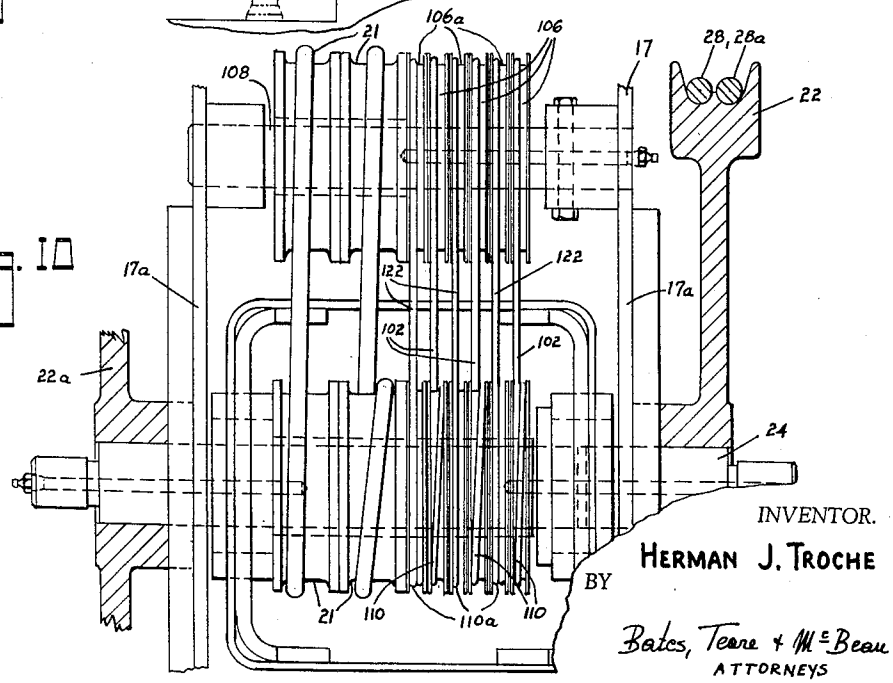


Fig. 10

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MOBILE AERIAL TOWER

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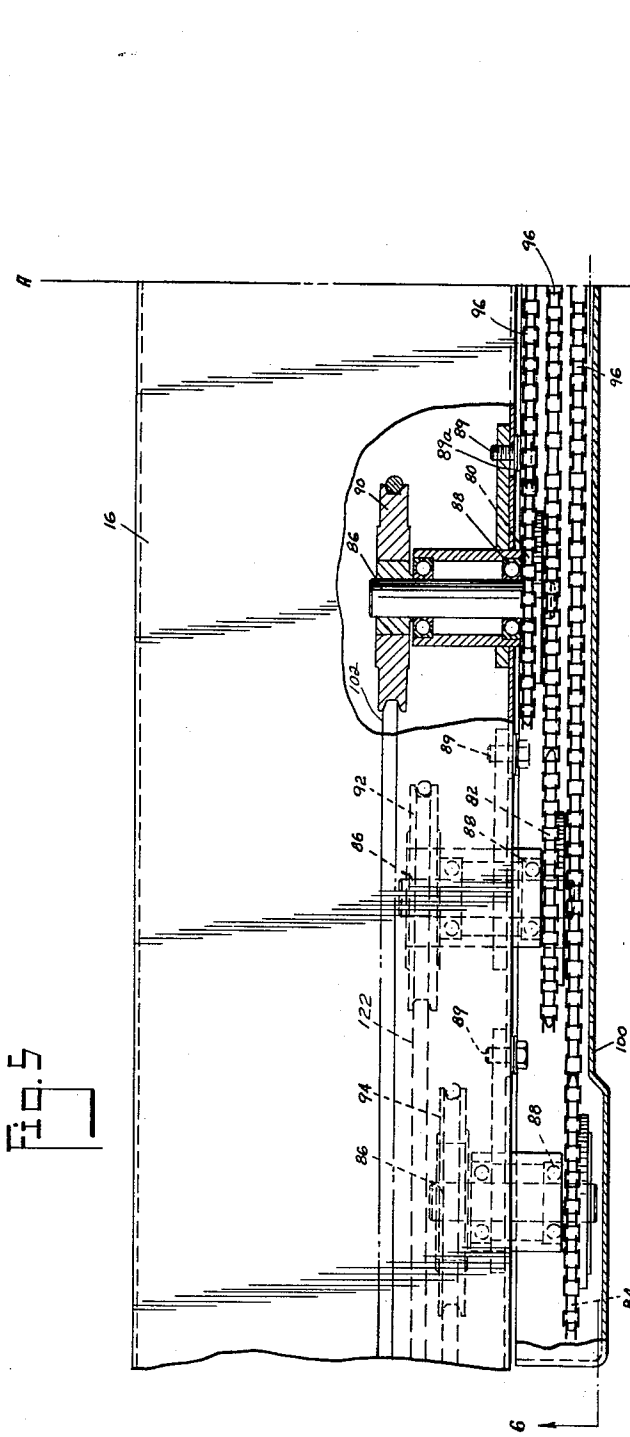


Fig. 5

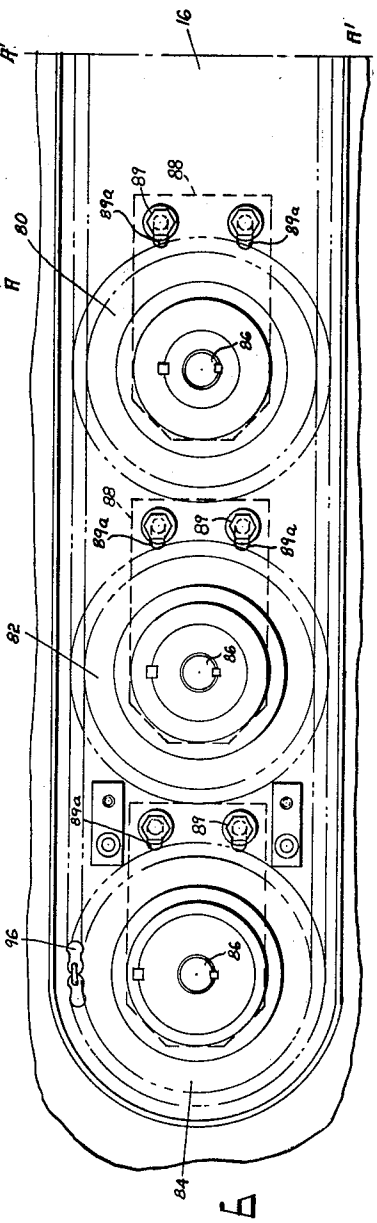


Fig. 6

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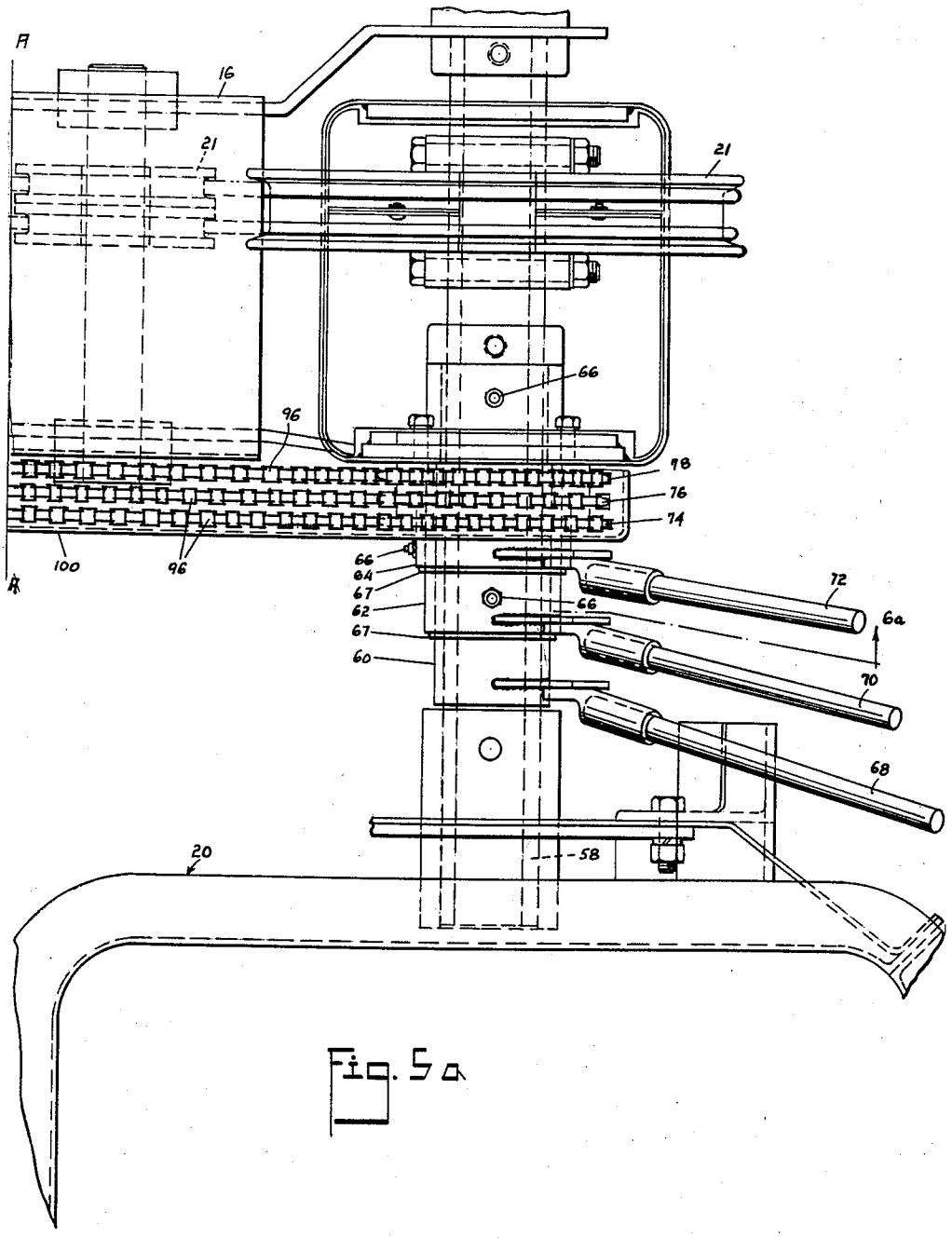


Fig. 5a

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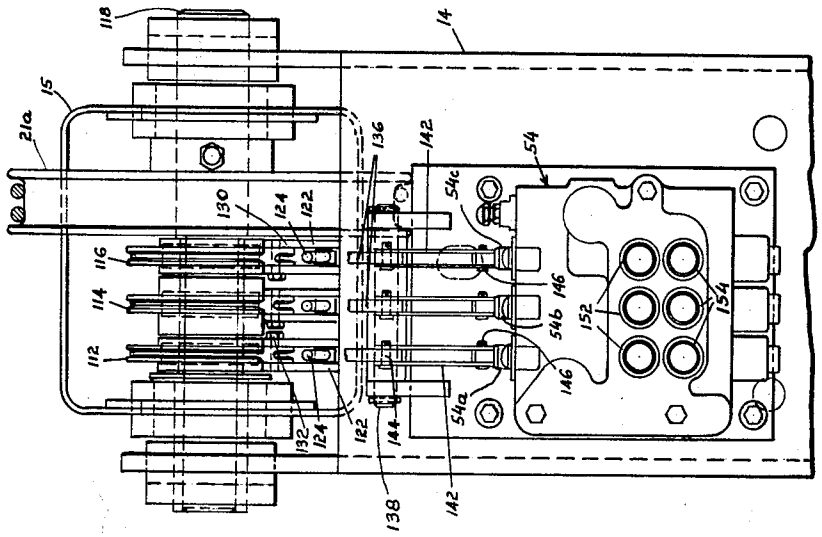


Fig. 8

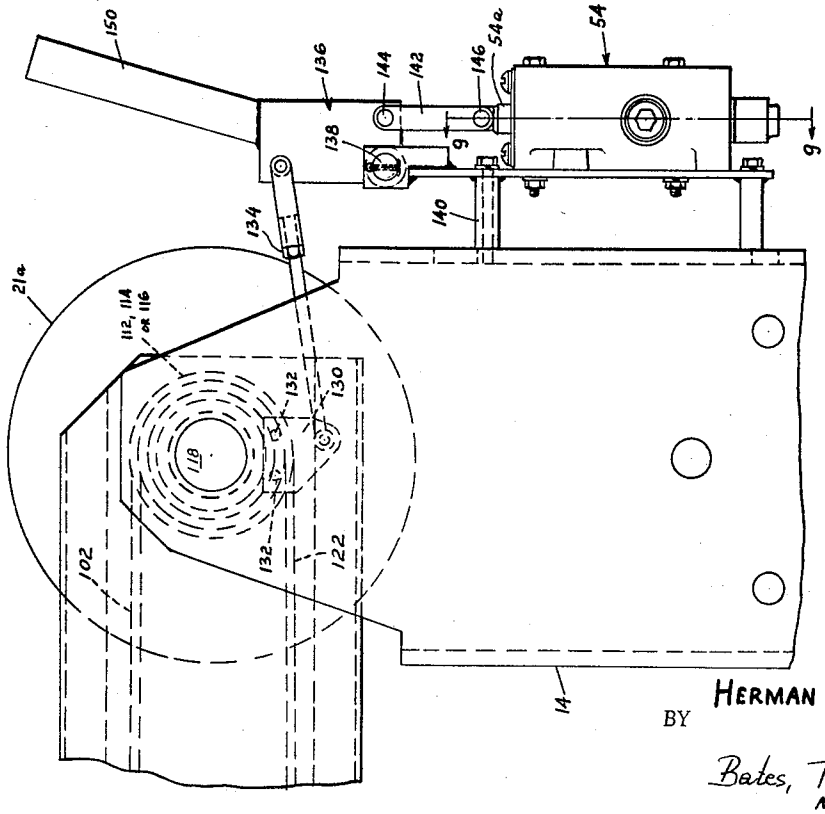


Fig. 7

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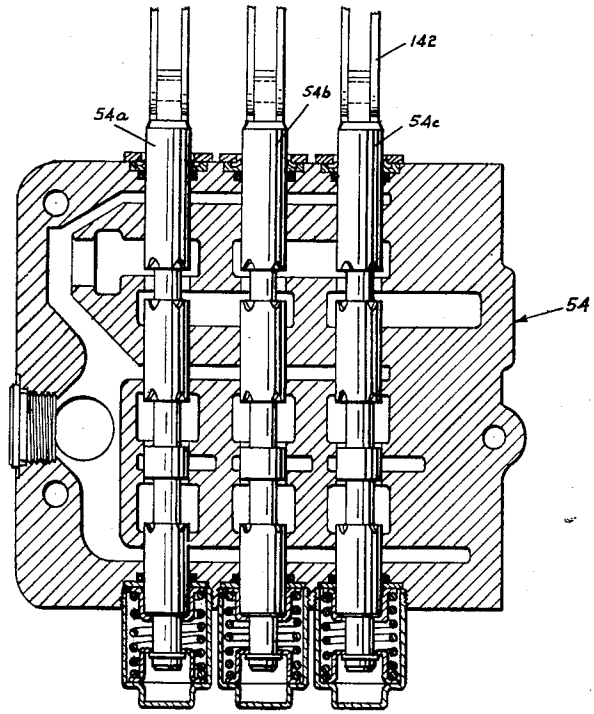


Fig. 9

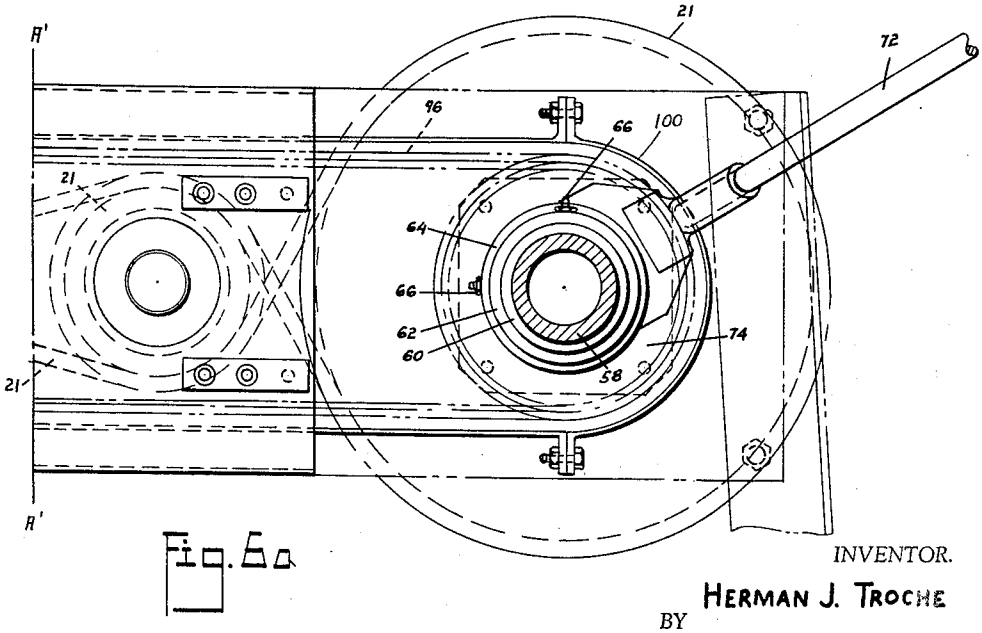


Fig. 6a

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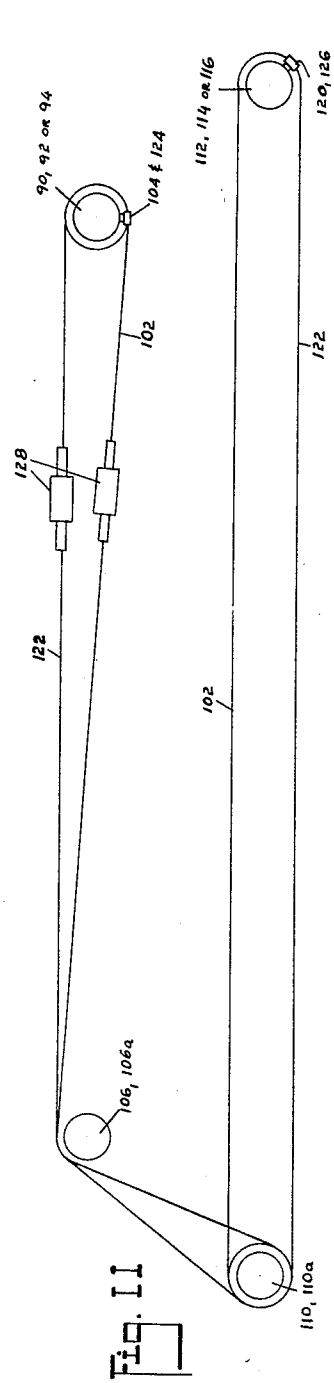


Fig. 11

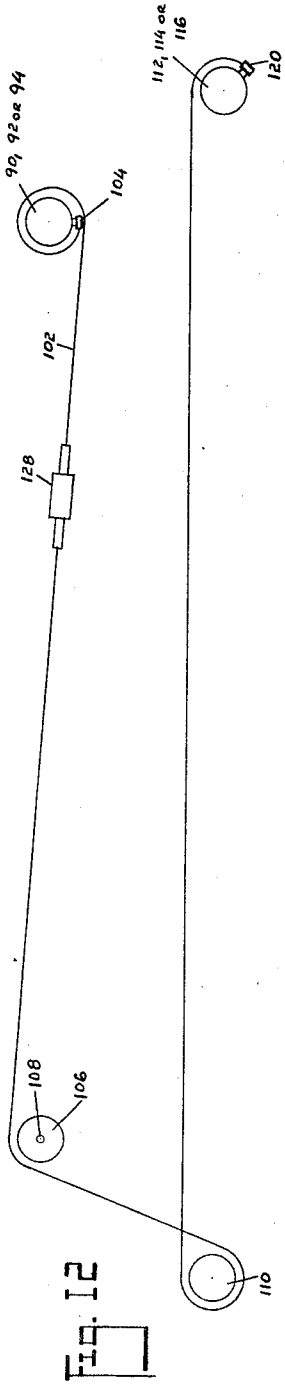


Fig. 12

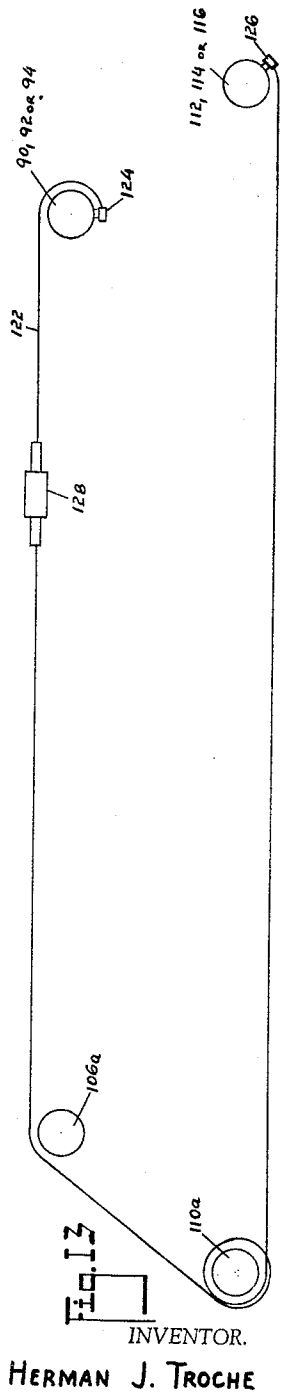


Fig. 13

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United States Patent Office 2,915,137 Patented Dec. 1, 1959

2,915,137

MOBILE AERIAL TOWER

Herman J. Troche, Fairview Park, Ohio, assignor to J. H. Holan Corporation, Cleveland, Ohio, a corporation of Ohio

Application May 5, 1958, Serial No. 732,893

4 Claims. (Cl. 182—2)

This invention relates in general to a mobile aerial tower of the articulated type and to control mechanism therefor which can be operated to cause actuation of fluid powered motor units for positioning the mobile aerial tower and associated work platform structure on the outer end thereof, to any selected longitudinal or vertical angle and at various extended distances, to provide acess to overhead traffic lights, street lamps, and similar objects for installation, maintenance and repair. The invention relates more particularly to a mechanical control system which extends up through the movable portions of the tower and includes a pilot control unit mounted adjacent the work platform structure for selective and ready actuation by workmen on the platform, thus permitting such workmen to control the movement of the work platform and associated aerial tower to any desired position.

In recent years, control systems for movable aerial towers of the type with which the present invention is concerned have often incorporated hydraulic or electrical compounds for initiating the actuation of power devices which provide for the various positional movements of the aerial tower and the associated work platform structure. However, since the desirable design of such a tower is of the foldable or articulated type, comprising relatively movable sections, and since various componnts of the control system therefor (i.e. fluid lines or electrical lines) are supported on the relatively movable tower sections, such components of the control system are relatively easily susceptible to breakage and fracture, resulting in increased maintenance costs and possible disablement of the tower for use, and accordingly such prior art control arrangements have not always been completely satisfactory.

The present invention provides a mechanical control system including a plurality of flexible members which extend through the sections of the aerial tower and which are expeditiously mounted thereon in an operative manner, which obviates their interference with movements of the tower sections with respect to one another and to the support structure for the tower, and which may be effectively actuated by pilot control mechanism located on the work platform structure of the aerial tower, for the selective and effective positioning of the aerial tower by a workman disposed on the work platform.

Accordingly, an object of the invention is to provide mechanical control mechanism for an aerial tower including a pilot control unit mounted in conjunction with the work platform structure of the tower, for selective and positive actuation and control of a fluid power system for controlled movement of the aerial tower to a variety of positions.

Another object of the invention is to provide a control mechanism of the latter mentioned type which can be effectively mounted and supported on relatively movable sections of the aerial tower without interference with the positional movements of the tower, and which is not readily subject to breakage and failure in operation.

A more specific object of the invention is to provide an

articulated aerial tower which is movable to a variety of positions by a plurality of fluid actuated power devices and including valve means for controlling the flow of actuating fluid to said power devices, and wherein there is provided a mechanical control system for operating said valve means with said control system including a pilot control unit mounted adjacent the work platform structure of the aerial tower and operatively connected to the valve means located on the aerial tower supporting structure by means including flexible elements extending through the various tower sections and operatively mounted thereon by a novel drum or sheave system.

Other features and advantages of the invention will be apparent from a consideration of the following description taken in conjunction with the accompanying drawings wherein:

Fig. 1 is a top plan view of a utility vehicle carrying an aerial tower in accordance with the instant invention.

Fig. 2 is a side elevational view of the utility vehicle and aerial tower illustrated in Fig. 1.

Fig. 3 is a perspective view of the utility vehicle and mobile aerial tower of Fig. 1, illustrating in dot-dash lines various positions of the tower and associated work platform structure.

Fig. 4 is a side elevational view of the utility vehicle and aerial tower of the invention showing further positional movement of the articulated aerial tower mechanism.

Figs. 5 and 5*a* represent an enlarged, partially sectioned, fragmentary plan view taken substantially along line 5—5*a* of Fig. 2, and illustrating more or less in detail the pilot control unit mounted on the work platform portion of the aerial tower and associated chain and sprocket connecting mechanism to the cable system of the control mechanism, which operates to actuate the fluid powered motor units in the aerial tower driving mechanism.

Figs. 6 and 6*a* illustrate a partially sectioned, side elevational view of the Figs. 5 and 5*a* mechanism, taken substantially along lines 6—6*a* of Figs. 5–5*a*, looking in the direction of the arrows.

Fig. 7 is an enlarged, fragmentary, side elevational view of the aerial tower pedestal or mast structure, and illustrating the connection of the cable control system to the valve mechanism which controls the flow of actuating fluid to the various fluid motor units of the aerial tower apparatus.

Fig. 8 is a partially broken, end elevational view taken substantially from the right hand side of Fig. 7.

Fig. 9 is a vertical sectional view of the valve mechanism taken substantially along line 9—9 of Fig. 7, looking in the direction of the arrows.

Fig. 10 is an enlarged, fragmentary, partially sectioned, end elevational view taken substantially along 10—10 of Fig. 2, looking in the direction of the arrows.

Fig. 11 is a diagrammatic representation of the sheave and cable control system showing the stirring thereof for operating the distributing valve mechanism of the fluid powered aerial tower apparatus.

Fig. 12 is a diagrammatic representation illustrating the stringing of one-half of the sheave and cable control system of Fig. 11.

Fig. 13 is a diagrammatic representation illustrating the stringing of the other half of the sheave and cable system of Fig. 11.

Referring again to the drawings, there is shown a wheeled utility vehicle 10, having a truck-body 11 which carries a vertical mast or pedestal 12, the upper portion 14 of which is rotatable through 360°, and supports a collapsible or articulated tower assembly at its upper extremity. The collapsible tower assembly includes a pair of tower sections 15 and 16 pivotally interconnected

at one of their adjacent ends through the saddle member 17, and carries, in the embodiment of the invention shown, a plurality of work platforms 20 and 20a at its upper extremity. While a pair of work platforms are illustrated in the drawings, it will be understood that only one work platform could be utilized if so desired. The work platform structure 20, 20a is maintained in a level condition with respect to the vehicle body 11 by means of a leveling cable and drum system generally referred to by number 21 and including a fixed drum 21a (Figs. 2 and 7) secured to the upper end of rotatable portion 14 of the mast 12. The latter arrangement maintains the work platform structure level irrespective of the pivotal movements of the tower sections 15 and 16 with respect to the vehicle body, such a leveling arrangement being known to those skilled in the art and accordingly will not be described here in greater detail.

The lower tower section 15 is pivotally connected as at 18 to the upper extremity of the rotatable portion 14 of the mast 12 for tilting movement in a vertical plane.

The pivotal interconnection by means of saddle member 17 between the upper and lower tower sections 16 and 15 respectively is such that the upper section 16 is pivotal in a vertical plane relative to the lower section 15. In this connection and referring in particular to Figs. 2, 4 and 10, in the embodiment of the invention shown, the outer end of lower tower section 15 has a pair of transversely spaced, double section sheaves 22 and 22a rotatably mounted by means of shaft 24, on opposite outer sides thereof and secured to the downwardly and outwardly extending ends 17a of bifurcated saddle member 17. Saddle member 17 is secured to the adjacent end of upper mast section 16 and upon rotation of sheaves 22 and 22a, saddle member 17 is pivoted in a vertical plane, thereby pivoting upper tower section 16 with respect to the lower tower section 15. Another pair of single section sheaves 26 and 26a are rotatably mounted on opposite outer sides of lower tower section 15 in generally longitudinally spaced relation to sheaves 22, 22a and are connected to the latter by flexible elements or cables 28, 28a (Figs. 1 and 2). One end of cable 28a is anchored as at 30 to the associated sheave 22 or 22a and the cable 28a is then reeved in a counterclockwise direction (as viewed in Fig. 2) about one section of the associated sheave 22, 22a, and the other end of the cable is then anchored as at 32 to bracket structure 34. One end of cable 28 is anchored as at 35 to the upper portion of the other section of the associated double sheave 22, 22a, is strung rearwardly with respect to the utility vehicle, around the associated sheave 26, 26a and then is tautly anchored at the other end 37 to the respective side of the aforementioned bracket structure 34. Bracket 34 is of the adjustable length type comprising adjusting bolt and nut elements 37a. The piston rod 38 of a fluid actuated, double acting piston motor 40 is connected as at 39 (Fig. 2) to the bracket structure 34, intermediate cable strands 28 on either side of the tower structure, and upon retraction or inward movement of the piston rod from the Fig. 2 position, cable elements 28a are tensioned, thereby causing rotation of sheaves 22, 22a and pivoting of saddle member 17 and attached upper tower section 16 about the axis of shaft 24. Upon pivoting of upper tower section 16 in a counter-clockwise direction (as viewed in Fig. 4) beyond a vertically upright position with respect to the horizontal, it will be seen that gravity will cause the upper tower section 16 to pivot further with respect to the lower tower section 15 and therefore the cable elements 28a will slacken. The cable elements 28 will then take over and prevent the upper tower section 16 from free pivoting movement throughout the remainder of its pivotal range in a counter-clockwise direction, such cables (28) being tensioned by the holding action of the piston rod 38 of motor unit 40 with respect to the attached bracket structure 34. For pivotal movement of the upper tower section 16 with respect to the lower tower section in a clockwise direction (as viewed in Fig. 3), cable members 28 will be the actuating elements up to a vertically upright position of upper tower section 16, after which cable members 28a will serve as the braking elements of the arrangement, when gravity takes over as aforediscussed. It will be seen therefore that with such a sheave and cable arrangement, the pivotal movement of the upper tower section 16 with respect to the lower tower section 15 can be effectively and selectively controlled throughout the pivotal range of the upper tower section.

The lower tower section 15 is tilted by means of a fluid actuated, double acting, piston motor 42 whose cylinder 44 is anchored to a bracket 46 carried by the rotatable portion 14 of the mast 12 and whose piston rod 48 is pivotally connected at its external extremity to a bracket 50 mounted intermediate the ends of the lower tower section 15. The upper portion 14 of the mast 12 is rotated by means of two-way, fluid actuated motor 52 (Fig. 2) which is provided with a driving connection with the upper portion 14 of the mast in any suitable manner such as by means of the gearing arrangement 53 illustrated.

Retractable fluid actuated jacks 54 extend outwardly from the sides of the vehicle body 11 to engage the ground surface and thereby anchor the vehicle body in a stationary position to insure stability during movement of the tower sections and the mast. The jacks 54 may be extended and retracted in any suitable manner as for example by fluid actuated motor units which may be coupled to a source of operating fluid in a conventional manner. The universality of movement of the work platform structure 20, 20a relative to the supporting vehicle body 11 provides virtually unlimited access to any point relative to the vehicle and within the dimensional limits of the structural members of the tower.

Controlled operation of the collapsible tower assembly to present the work platform structure 20, 20a to any desired work location is accomplished by selectively supplying operating fluid to each of the fluid motors 40, 42 and 52 through a conventional fluid piping system including fluid supply and fluid return lines. The supply of operating fluid to each of the fluid powered motor units 40, 42 and 52 is selectively controlled by means of a main, multi-stage, distributor valve 54 which is of the open center type including a pressure relief valve—well-known in the art—the more or less detailed construction of which may be seen in Fig. 9.

Distributor valve 54 is mounted on the rotatable portion 14 of the mast 12 adjacent the pivoted connection 18 of the tower section 15 to the mast structure. Operating fluid for the system is supplied by the variable output pump (not shown) of conventional well-known design mounted on the vehicle body and which may be independently engine driven or may be coupled to a power take-off on the drive shaft of the vehicle transmission, to pump operating fluid from a reservoir supported on the truck body and in a manner well-known in the art. The valve spools 54a, 54b and 54c of the distributor valve 54 are adapted to be positioned axially by the mechanical control system to be hereinafter described in detail to direct operating fluid from the inlet port of the distributor valve to the proper feed lines of the respective fluid powered motor units 40, 42 and 52, for actuation of the latter, thereby causing movement of the associated aerial tower apparatus to the desired position. All of the valve spools 54a, 54b and 54c may be independently actuated or they may be actuated together in various combinations to accomplish a compound movement of the aerial tower apparatus by multiple energization of the corresponding portions of the mechanical control system to be hereinafter described.

In accordance with the invention, a mechanical con-

trol system is provided including flexible elements or cables extending up through the hollow interiors of the articulated tower apparatus and mounted in operative relationship thereon by plurality of rotatable sheave or drum elements, and with a pilot control mechanism located adjacent the upper end of the tower structure and within ready accessibility by workmen standing on the work platform structure **20** and **20***a*.

As aforementioned, each of the work platforms are supported in cantilever fashion from the upper extremity of the upper tower section **16** by means of shaft member **58** (Figs. 1 and 5*a*) which in the embodiment illustrated, is of hollow or tubular construction. Rotatably mounted on shaft **58** are a plurality of telescoped sleeve elements **60**, **62** and **64** which are rotatable with respect one another and include grease fittings **66** for facilitating such relative rotary movement. Retainer members **67** detachably secured to the associated of the sleeve members prevent relative axial movement between the sleeve members. Secured to each of the sleeves **60**, **62** and **64** is a handle element **68**, **70** and **72** respectively, for manually rotating the respective sleeve element. The inner end of the sleeves are disposed in the same "stepped" relationship as the outer ends thereof, and secured to each of such "stepped" inner ends of the sleeve elements are drive sprocket members **74**, **76** and **78** respectively.

Rotatably mounted on one side of upper tower section **16** are a plurality laterally stepped follower sprocket members **80**, **82** and **84** (Figs. 5 and 6). Each of the latter sprocket members is secured to a shaft member **86** which is rotatably mounted by means of bearing and mounting structure **88** to the confronting wall of the upper tower section **16**. Structure **88** is adjustably mounted on tower section **16** by means of fastener elements, such as bolts **89**, and associated elongated slots **89***a* in the side wall of the upper tower section **16**. Each of shaft members **86** has a drive sheave element **90**, **92** or **94** secured to the respective inner end thereof, such sheave elements being disposed within the hollow interior of the upper tower section **16**. Thus upon rotation of sprocket members **80**, **82** or **84**, a respective sheave member **90**, **92** or **94** is rotated therewith. Sprocket members **80**, **82** and **84** are disposed in generally longitudinally aligned relation with sprocket members **78**, **76** and **74** respectively, as can be best seen in Figs. 5 and 5*a*, and an endless chain **96** is entrained around each of the aligned pairs of sprocket members. Each of the drive sheaves **90**, **92** and **94** is connected by a flexible cable system to one of the control spools of the main distributor valve **54**, such flexible elements or cables being mounted on the articulated tower sections by means of a sheave system to be hereinafter described in detail, for controlling the positioning of the spools of the distributor valve **54**, and thus controlling the powered positional movements of the aerial tower apparatus.

The aforementioned pilot control sprockets **74**, **76**, **78**, **80**, **82** and **84** and associated driving chains **96**, are preferably enclosed by a housing guard **100** since such sprocket and chain mechanism is disposed exteriorly of the tower sections.

The cable system and related sheave and linkage apparatus for connecting the pilot control mechanism disposed adjacent the work platform structure and above described, with the valve spools of the main distributor valve **54** will now be described. Referring in particular to Figs. 11 and 13 inclusive, which diagrammatically illustrate the stringing of one sheave and cable system located on the articulated aerial tower sections, and which provides for the remote control mounting of the pilot control mechanism on the upper end of the tower structure, it will be seen from Fig. 12, which illustrates one-half of the stringing arrangement for each of three separate cable systems (one cable system being utilized to actuate one of the main distributor valve spools) that one end of a cable **102** is anchored as at **104** to one of the drive sheaves **90**, **92** or **94** disposed adjacent the upper end of the tower, is wrapped in a clockwise direction (as viewed in Fig. 12) about the associated sheave, is extended through the interior of the upper tower section **16** and looped over an idler sheave **106** rotatably mounted on a shaft **108** (Fig. 10) on the pivoted end of upper tower section **16**. The cable **102** is then trained downwardly through the open face of the saddle member **17** and is looped in a clockwise direction (as viewed in Fig. 12), about another idler sheave **110** rotatably mounted on the aforementioned shaft **24** on the outer end of lower tower section **15**. From sheave **110** the cable **102** is extended rearwardly with respect to the truck chassis through the hollow interior of lower tower section **15** to be looped over one of a set of valve spool control sheaves **112**, **114** and **116**, rotatably mounted on a shaft **118** which is secured to the upper portion of rotatable section **14** of the mast structure **12**. The end of the cable element **102** is then anchored as at **120** to the respective one of the spool control sheaves **112**, **114** or **116**. The other half of the mounting for each of the valve spool remote control systems is diagrammatically illustrated in Fig. 13 wherein one end of a flexible element or cable **122** is anchored as at **124** to the associated sheave **90**, **92** or **94**, is looped in a counter-clockwise direction (as viewed in Fig. 13) thereover, is extended through the interior of the upper tower section **16** and looped over a respective idler sheave member **106***a* mounted on shaft **108** adjacent the pivoted end of upper tower section **16**, is extended downwardly along the open face of saddle member **17** and is entrained (in a counter-clockwise direction as viewed in Fig. 13) about a respective idler sheave member **110***a* rotatably mounted on shaft **24** on lower tower section **15**, and then is extended rearwardly with respect to the truck chassis through the interior of lower tower section **15** to be anchored as at **126** to the respective valve spool control sheave **112**, **114** or **116**. The combined cable mounting arrangement for each of the remotely controlled valve spool systems is diagrammatically illustrated in Fig. 11, or in other words Fig. 11 is merely a combination of the elements of Figs. 12 and 13. Turn buckle members **128** of conventional well-known type are associated with each of the cable elements **102** and **122** for adjusting the tension of the latter during service operations of the tower apparatus, and covered access openings **129** (Fig. 1) are provided in the defining walls of upper tower section **16** to provide ready access to turn buckle elements **128**.

Each of the spool control sheaves **112**, **114** and **116** is connected to a respective one of the main distributor valve spools **54***a*, **54***b* and **54***c* by a bracket **130** (Fig. 7) suitably secured as by means of fastening elements **132** to the respective one of the control sheaves, an adjustable length driver link element **134**, a rocker member **136** pivotally mounted as by means of a pin **138** to bracket structure **140** secured to portion **14** of the mast, and follower link **142** which is pivoted as at **144** to the respective rocker element **136** and as at **146** to the upper end of a respective valve spool. Secured to each of rocker members **136** is a handle element **150** which provides for independent manual control for positioning the distributor valve spools from the vehicle body in case of special circumstances or in the event of an emergency. The main distributor valve **54** is mounted on the aforementioned bracket structure **140** below rocker members **136** and is connected in a well-known manner by distributor port **152**, **154** and conventional associated feed and return lines, to the respective fluid powered motor units **40**, **42** and **52**, which move the aerial tower mechanism to any desired position.

As hereinbefore indicated, the distributor valve spools **54***a*, **54***b* and **54***c* may be positioned individually or in various combinations to accomplish individual or compound movements of the various operative components of the tower assembly by manual positioning of the handle elements **68**, **70** and **72** of the pilot control mechanism remotely located with respect to the main distributor valve **54**, adjacent the work platform structure located at the upper end of the tower structure. The valve spools can also be manually actuated as aforediscussed by the hand operated levers **150** on the rocker elements **136** disposed just above the main distributor valve unit which is mounted on the rotatable mast section **14**.

A suitable material for the control cables **102** and **122** of the remote control cable systems has been found to be one-eighth inch diameter steel aircraft cable which possesses the necessary strength and flexibility for the purposes described.

With such a remote control system and mechanism as aforedescribed, the remote pilot control levers **68**, **70** and **72** remain in level position relative to the work platform structure mounted on the upper end of the movable aerial tower apparatus regardless of the amount of movement of the various components of the tower. The drive chain and sprocket arrangement readily translates control of the main distributor valve from the hollow interior of the upper tower section to the exterior thereof, in an uncomplicated yet positive manner, and permits the remote control levers to be mounted on the work platform support shaft **58** in an expeditious manner which prevents interference between the movable tower sections and the control levers, and wherein the latter are readily accessible to a workman positioned on the work platform structure. The direct mechanical connection of the control levers to the valve spools of the main distributor valve provides a good "feel" at the control levers for effective starting and stopping of the movement of the tower apparatus. The mechanism is easily and readily maintained, and adjustments may be made thereto without the need for special tools and the like. Another advantage to the mechanical cable control system is that electrical insulation may be readily provided by inserting sections of non-conducting material in the control cable assemblies **102**, **122**. It will be understood that while only one set of pilot controls is illustrated in the drawings with the paired work platform structure, dual controls could readily be provided on the aerial tower with one set being associated with each of the work platform structures **20**, **20***a*.

From the foregoing description and the accompanying drawings it will be seen that the invention provides an improved collapsible aerial tower apparatus embodying a mechanical remote control system and mechanism for readily and positively controlling the application of fluid pressure to various fluid motor units which actuate the various components of the tower apparatus.

The terms and expressions which have been employed are used as terms of description and not of limitation and there is no intention in the use of such terms and expressions of excluding any equivalents of any of the features shown or described or portions thereof, but it is recognized that various modifications are possible within the scope of the invention claimed.

I claim:

1. An aerial tower comprising in combination, a base, a tower section having one end pivotally mounted on the base for tilting movement in a vertical plane, a second tower section having one end pivotally coupled to the other end of the first tower section for relative tilting movement in a vertical plane, said tower being operatively supported on the base for unitary rotation in a horizontal plane, work platform structure carried adjacent the upper end of said second tower section, a plurality of fluid actuated motor units for independently rotating and moving said tower sections to selectively locate the work platform structure in any selected horizontal and vertically angled piston and distance relative to the base, fluid distributing valve means located adjacent the base for selectively controlling the application of operating fluid to each of said motor units, pilot control mechanism including a plurality of manually manipulatable levers located on said work platform structure, a drive sheave element rotatably mounted on said second tower section and operatively connected to said pilot control mechanism, a sheave element rotatably mounted on said one end of said second tower section, another sheave element rotatably mounted on said other end of said first tower section, a further sheave element rotatably mounted on said one end of said first tower section, means connecting said further sheave element to said fluid distributing valve means for actuation of the latter, and flexible means interconnecting said sheave elements and coacting therewith in response to movement of said levers to operate said fluid distributing valve means.

2. An aerial tower in accordance with claim 1 wherein said pilot control mechanism includes means for transferring the movement of said levers to said driver sheave element, said last mentioned means comprising a rotatable member mounted on said tower and operatively connected to said levers, another rotatable member mounted on said tower in longitudinally spaced relation to said first mentioned rotatable member, and flexible means connecting said rotatable members, said second mentioned rotatable member being operatively connected to said driver sheave element.

3. In a control system for multiple element aerial tower having a plurality of fluid actuated motors for independently moving the tower elements relative to each other, a multispooled distributing valve for selectively supplying operating fluid to each of said motors, pilot control mechanism mounted on said tower remote from said distributing valve, said pilot control mechanism comprising a plurality of manually operable pivotal levers, a drive sprocket member operably connected to each of said levers, a follower sprocket member rotatably mounted on said tower in generally longitudinally spaced relation to each of said drive sprocket members, an endless chain entrained about each of said longitudinally spaced pairs of sprocket members, a drive sheave member operatively connected to each of said follower sprocket members, a system of idler sheave members mounted on said tower along the direction of extension thereof, flexible cable elements entrained about said sheave members and coacting with the latter to rotate the same upon pivotal movement of said levers, and linkage means connecting said idler sheave system to the spools of said distributing valve for translating the rotary motion of the sheave members into axial movement of the valve spools for controlling the flow of operating fluid to said motors.

4. In a multi-element aerial tower having a plurality of fluid actuated motors for independently moving the tower elements relative to each other, a control system comprising a multi-stage distributing valve for selectively supplying operating fluid to each of said motors and means for selectively actuating said distributing valve to control the flow through each stage thereof, said means comprising a pilot control mechanism mounted on said tower remote from said distributing valve and connecting means disposed along said tower elements and operatively connecting said pilot control mechanism to said distributing valve, said pilot control mechanism including a plurality of manually operable control levers each of which controls the flow of fluid through a corresponding stage of said distributing valve, means independently coupling each of said control levers to said connecting means for actuating the latter, said connecting means comprising a plurality of sheave members mounted on

said tower sections and flexible elements entrained about said sheave members and coacting with the latter to transfer the movement of said levers to said distributing valve to thereby control the application of fluid pressure to said motor units from said remotely located pilot control mechanism.

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