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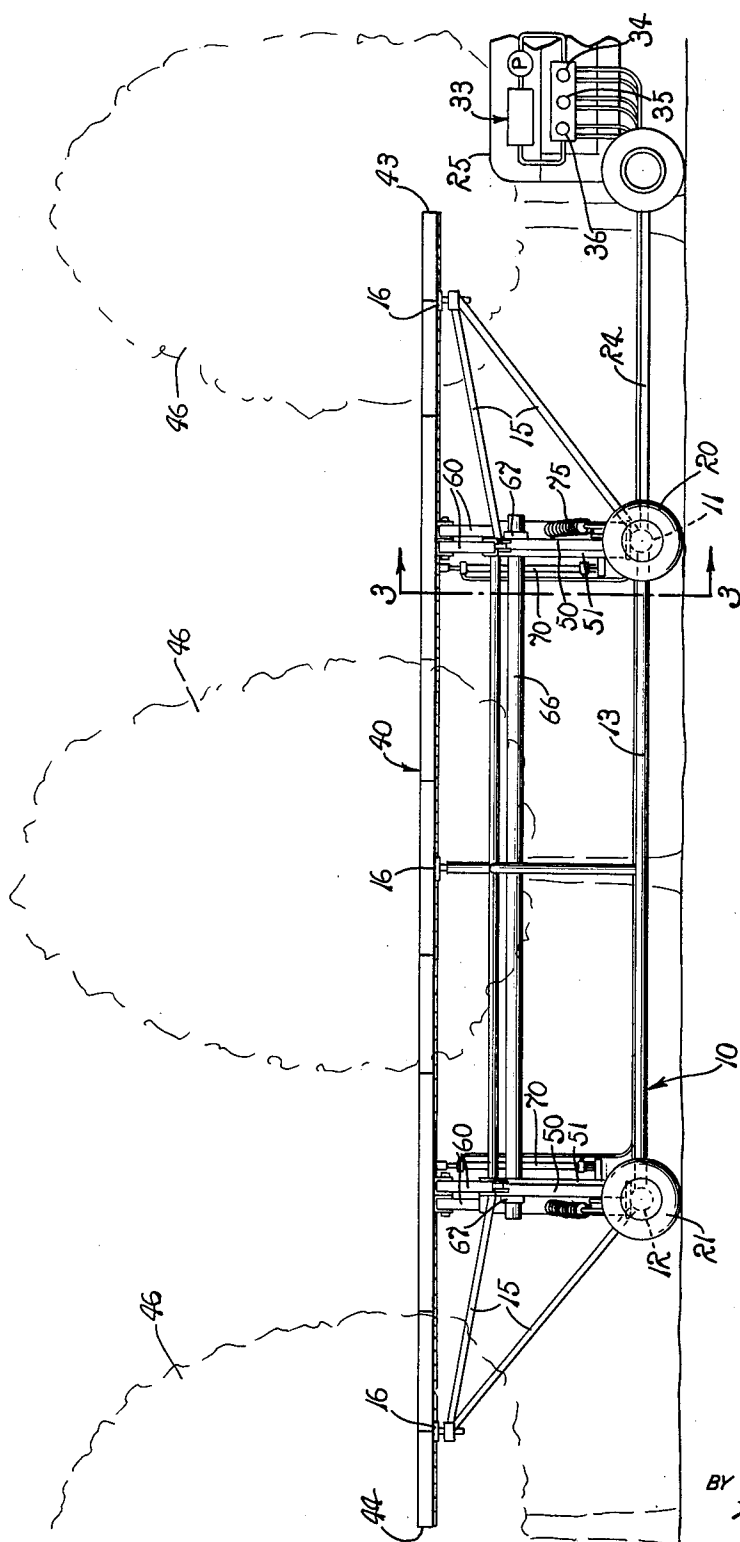
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MOBILE COLLAPSIBLE SCAFFOLD

Filed Jan. 15, 1962

4 Sheets-Sheet 2



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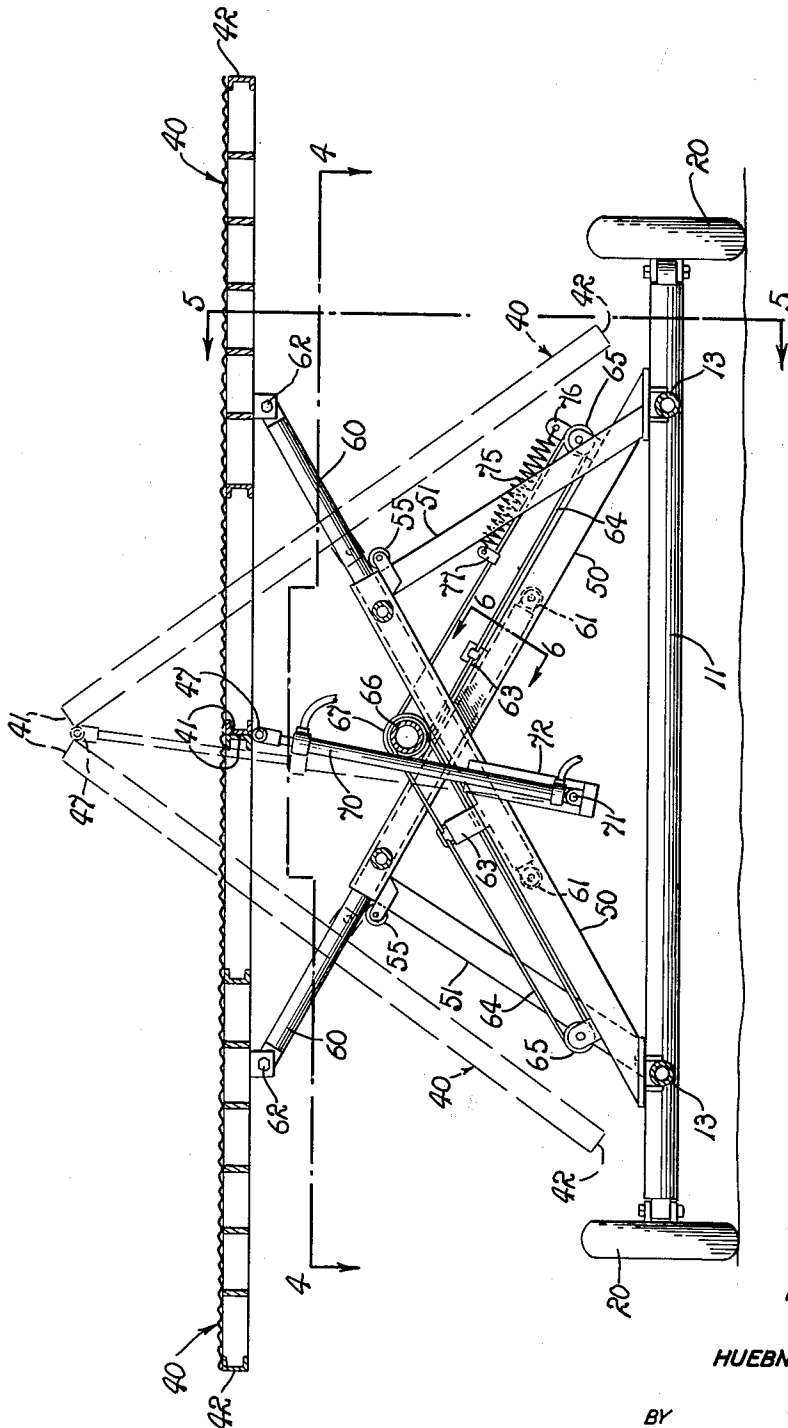


FIG. 3.

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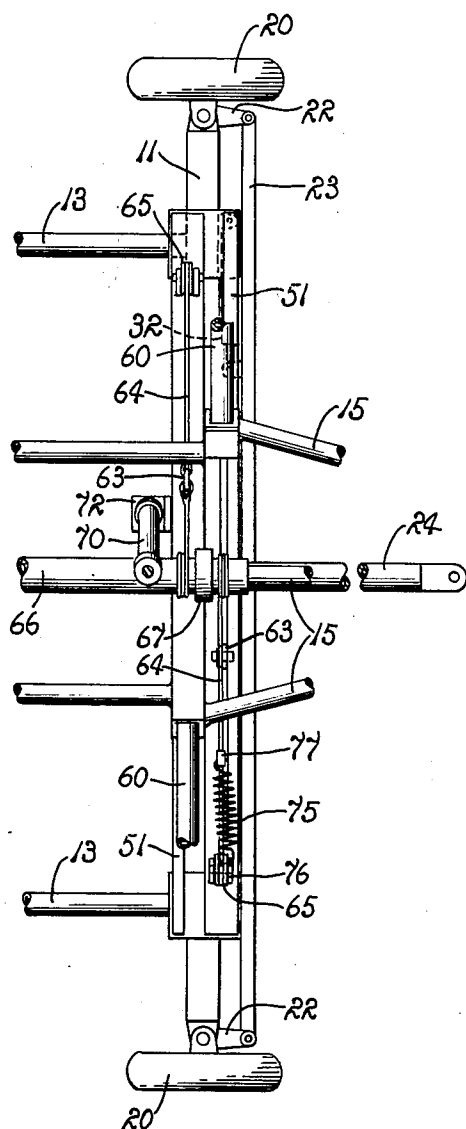


FIG. 4.

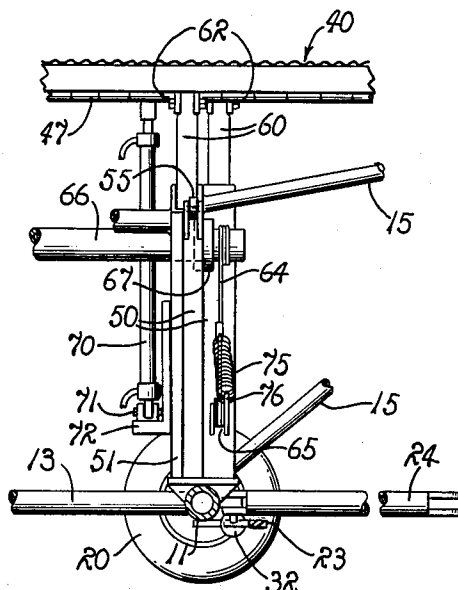


FIG. 5.

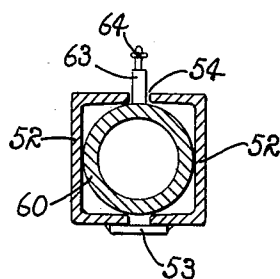


FIG. 6.

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MOBILE COLLAPSIBLE SCAFFOLD

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9 Claims. (Cl. 182—131)

This invention relates to a mobile scaffold adapted for supporting personnel at an elevated work station adjacent to upright objects. It particularly relates to an improved foldable scaffold adapted for movement between an extended horizontal position and a retracted folded position in which an improved mechanism is provided for extension and retraction of the platform.

The mobile scaffold of the present invention was designed specifically for use in the care and maintenance of orchards. Nevertheless, the scaffold is also adapted for use with many types of upright or tall objects and is not necessarily limited to use in orchards, although the description conveniently refers to such operational environment. Certain types of mobile scaffolds having foldable platforms have been used to supplant ladders conventionally used to support workmen in orchards during the pruning, thinning, and picking of the trees. The advantages of such mobile scaffolds are primarily the safety of the workmen and the increased efficiency in the performance of the aforementioned operations. To permit the use of such scaffold at a maximum degree of utility, the mechanism employed for extending and retracting the scaffold must be capable of performing these operations in a minimum amount of time.

Accordingly, it is an object of the present invention to provide an improved mobile scaffold having a retractable support platform.

Another object is to provide a mobile scaffold with mechanism to extend and retract a work platform in a minimum of time.

Another object is to provide a mobile retractable scaffold for use in an orchard and which is adapted while in a retracted position for earth traversing movement between a pair of adjacent rows of trees and which is also adapted for extension into a working position between the rows and between trees in the rows to enable workmen to gain access to a plurality of trees in such rows.

Another object is to provide a mobile scaffold with a retractable platform for movement between an extended work position and a retracted travel position in which the lateral dimensions are minimized to permit earth traversing movement.

A further object of the invention is to provide, in a mobile scaffold having a foldable work platform of multiple sections, an improved mechanism to insure synchronous movements of such multiple sections comprising the platform.

These, together with other objects, will become more fully apparent upon reference to the following description and accompanying drawings.

In the drawings:

FIG. 1 is a top plan view of a retractable scaffold embodying the principles of the present invention.

FIG. 2 is a side elevation of the scaffold of FIG. 1.

FIG. 3 is a vertical, transverse section taken on line 3—3 of FIG. 2.

FIG. 4 is a fragmentary, top plan view taken from a position indicated by the lines 4—4 of FIG. 3.

FIG. 5 is a fragmentary view in longitudinal, horizon-

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tal section taken from a position indicated by the lines 5—5 in FIG. 3.

FIG. 6 is a somewhat enlarged, transverse, sectional view of a portion of the synchronizing mechanism employed in the present invention and taken from a position indicated by the lines 6—6 of FIG. 3.

Referring to FIGS. 1, 2 and 3, a mobile frame 10 is provided for the scaffold of the present invention and includes front and rear axles 11 and 12 rigidly interconnected by a pair of laterally opposed longitudinally extended side members 13. Additional rigidity is imparted to the frame by means of an intermediate cross member 14. The frame includes inwardly opposed outwardly projecting members 15. Both the inwardly projecting members 15 and the intermediate cross member 14 are provided with respective vertically adjustable pads 16 adapted to support the work platforms in a manner to be described below.

Both the front and rear axles are provided with respective pairs of laterally opposed wheels 20 and 21 rotatably mounted for ground traversing movement. Each of the wheels is also pivotally mounted at the outer end of the axle for movement about a vertical axis to effect steering of the scaffold. As shown in FIGS. 4 and 5, the steering mechanism for the front wheels includes opposed steering arms 22 and an interconnecting drag link 23. A push bar 24 is pivotally secured to the front axle and projects longitudinally from the frame for connection to a prime mover, or tractor, a portion of which is indicated at 25 in FIGS. 1 and 2. It will be obvious that the push bar may be used as a draw bar, if preferred. Although the scaffold may be self-propelled, the frame preferably takes the form of a pushed or pulled vehicle to reduce the weight of the scaffold to a minimum and to improve its mobility.

To enhance the maneuverability of the vehicle formed by the frame and ground engaging wheels, the rear wheels are also adapted for steerable movement. The rear wheels are also provided with respective steering arms 30, interconnected by a drag link indicated at 31 and shown in FIG. 1. A piston-cylinder assembly or control ram 32 is mounted on each of the axles and pivotally connected to the drag link adjacent to its respective axle. Each ram is individually connected to a suitable source of hydraulic fluid under pressure, such as is shown schematically at 33 mounted on the tractor 25, through reversible control valves, such as 34, 35, preferably mounted on the tractor in convenient operating proximity to the operator thereof. By controlled operation of the rams, opposite ends of the frame can be steered and the frame precisely positioned with respect to work objects or obstructions by longitudinal or canted movements, oblique movements of parallelism or any desired twisting or turning maneuver selected.

As shown in FIGS. 1, 2 and 3, a working area for personnel is provided by a pair of substantially rectangular platforms 40 having respective inner and outer edges 41 and 42 and substantially parallel front and rear edges 43 and 44. To adapt the scaffold for use in orchards, a plurality of notches 45 are formed in each of the platforms to partially encircle the periphery of orchard trees, indicated at 46. The platforms are adapted for movement to and from an extended work position shown in solid lines and retracted position shown in dashed lines

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by means of an elongated hinge 47 pivotally interconnecting the inner edges.

Longitudinally spaced on the frame are two pairs of laterally opposed fixed guides 50 in the form of inclined struts provided with internal guideways. Since all of the guides are identical, only one is described in detail. Each guide member is supported on the frame in a position extending outwardly and upwardly by means of a supporting leg 51. Each guide is formed from a pair of opposed elongated U-shaped channel members 52 joined by a closure plate 53, as indicated in FIG. 6. In this manner, an elongated slot 54 is provided throughout a substantial portion of the length of each guideway and a path of travel is defined by the channel members parallel to the slot. A roller 55 is secured to the guide at its outer upper end, and disposed with its periphery in juxtaposition to the path of travel defined by the channel members forming the guideway.

Partially received within each guideway is an extensible guide member 60 having a roller 61 fixed to its inner end to permit free longitudinal movement within the guideway. The outer end of the guide member is pivotally connected as at 62 to its respective platform 40 at a point intermediate the inner and outer edges of the platform. Each fixed guide and its associated extensible guide member constitute an extensible strut. Each guide member is provided with an ear 63 projecting upwardly through the slot 54 formed in the guideway. Opposite ends of a cable 64 are secured to the ear to form a closed circuit, the cable being trained about an idler pulley 65 at one end and an elongated idler drum 66 at the other end. The idler drum 66 is rotatably mounted in a substantially horizontal position longitudinally centrally of the frame 10 as by bearings 67 mounted on the guide struts 50 immediately above the intersection of the guide struts of each pair. It is to be noted that each pair of laterally opposed guideways at opposite ends of the frame utilizes the idler shaft 66 as a common rotatable member for each of the cables 64 constituting the respective closed circuit for the extensible guide members 60.

To effect extension and retraction of the work platforms 40, an extensible strut in the form of an hydraulic piston-cylinder assembly 70 is supported on each end of the frame by means of a pivotal connection, indicated at 71, fixed to a mounting lug 72 carried by one of the guideways 50. The opposite end of the piston-cylinder assembly is connected to the platforms at the elongated hinge 47. The source of pressure fluid as schematically illustrated at 33 is controlled by a suitable valve, such as is indicated at 36, to effect selective extension and retraction of the piston-cylinder assembly 70. For purposes of clarity to the mechanical portion of the scaffold, the hydraulic lines are not shown in all figures as being interconnected between the control valve 36 and the hydraulic cylinders 70, although it is to be understood that such is the case. This is also true of the valves 34 and 35 in relation to the front and rear steering rams 32. A schematic interconnection is shown only in FIG. 2.

To assist in the movement of both of the platforms during extension, a tension spring 75 is connected between an anchorage 76 fixed on one of the guideways 50 and an attachment lug 77 secured to the cable 64. The spring is tensioned during retraction of the scaffold and the energy stored therein is utilized during extension of the platforms to an operating position, as shown in full lines in FIG. 3.

Operation

The operation of the described embodiment of the subject invention is believed to be readily apparent and is briefly summarized at this point. As previously mentioned, the scaffold of the present invention is conveniently described in connection with the care and maintenance of an orchard. For this purpose, trees 46 are illustrated as they are normally grown in spaced parallel and right angularly related rows.

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The care of such an orchard normally requires that the trees be successively pruned, the fruit thinned, and the crop picked. While performing such operations, the scaffold is pushed between two adjacent rows of trees as shown in FIG. 1. It is to be understood that the platforms 40 are first folded to a position shown in dashed lines in FIG. 3 to permit earth traversing movement of the scaffold between the rows. Operation of the fluid pressure system schematically illustrated at 33 effects retraction of piston-cylinder assembly 70. Consequently, the work platforms 40 are moved from the retracted position shown in dashed lines to an extended work position shown in full lines in FIG. 3. During retraction of the piston-cylinder assembly, each of the extensible guide members 60 is partially withdrawn a predetermined distance from its respective guideway in the guide struts 50. Since each extensible member is provided with a cable 64 forming a closed circuit and the cable of each laterally opposed pair of extensible members at opposite ends of the frame are interlocked by means of the common idler drum 66, synchronous movement of the extensible guide members is insured. In addition, each extensible guide member is free to move within its respective fixed guideway by means of the rollers 55 and 61. Accordingly, a minimum amount of power is required to be exerted by the piston-cylinder assembly to effect extension and retraction of the work platforms.

Due to the particular geometry of the extension and retraction mechanism, the line of action of the force of the hydraulic cylinder 70 acting upon each of the extensible guide members 60 while in a completely retracted position is substantially at right angles to the path of travel defined by the respective guideways in the struts 50 of such guide members. Accordingly, the net force available for extension purposes is quite low in this particular position. To assist each guide member in its initial outward movement during extension of the platforms, the spring 75 is secured between the fixed anchorage 76 on one of the guideways and an attachment lug 77 of the cable associated therewith so that the spring is extended upon complete retraction of the platform. The energy thus stored in the extended spring is available to assist the initial outward movement of the extensible guide members. If desired, more than one guide member may be provided with a spring to assist in the initial portion of extension; however, since the closed circuits of cable systems are intended for synchronous movement by means of the common rotatable drum 66, ease of operation is readily obtained by utilizing only one spring, as illustrated. As soon as the line of action of the force exerted by the hydraulic cylinder 70 in acting upon the extensible guide members is more closely aligned with the path of travel defined by the respective guideway for each of such guide members, further extension of the guide members is readily effected by the hydraulic cylinder.

As soon as the operations being performed on each set of trees have been completed, the platform sections are folded to a transport position, and the scaffold drawn to the next set of trees. If any lateral movement of the scaffold is required, this can be readily effected through the use of the hydraulically actuated steering mechanism provided on both the front and rear wheels. As soon as the scaffold has been moved to its newly selected position, the platforms are extended as described above. Accordingly, it can be seen that a highly mobile scaffold has been provided which includes foldable platforms and extension and retraction mechanism for such platforms which reduces the amount of time required to move and adjust the platform from one set of trees to another.

The synchronizing mechanism insures coordinated movement between the foldable platforms and includes resilient means to urge the platforms to an extended position from a folded position. Consequently, the power requirements to cause such a change in positions is minimized and smooth operation is effected.

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Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A scaffold comprising an elongated mobile frame; a pair of elongated platforms having inner edges in juxtaposition and disposed longitudinally of the frame; pivot means interconnecting the platforms adjacent to said inner edges; first extensible strut means interconnecting the frame and said platforms at a point adjacent to said inner edges; second extensible strut means interconnecting the frame and each of said platforms respectively at points spaced from said inner edges; power means to effect extension and retraction of said first strut means; and means to synchronize extension and retraction of said second strut means.

2. A mobile scaffold comprising a pair of platforms provided with laterally opposed outer edges and pivotally interconnected inner edges, said platforms being adapted for movement to and from a first position of extension wherein the platforms are disposed substantially horizontally and in coplanar relationship and a second position of retraction wherein said platforms are angularly related to each other; a mobile frame; an extensible hydraulic piston-cylinder assembly connected between the frame and said pivotally interconnected inner edges; a source of fluid pressure including control means to effect extension and retraction of the cylinder; a pair of laterally opposed extensible struts each having a fixed guide secured to the frame and providing a guideway and an extensible guide member having one end pivotally connected to a respective platform at a point intermediate said inner and outer edges and having an opposite end constrained to a predetermined path of movement by the guideway of said fixed guide; separate closed circuit systems for each of said extensible guide members to indicate their respective degrees of extension and retraction; and synchronizing means interconnecting said closed circuit systems to maintain both of said extensible guide members at the same relative position of extension and retraction.

3. The folding scaffold of claim 2 wherein each of said closed circuit systems comprises a continuous cable secured to said extensible guide member and trained over longitudinally spaced rotatable members; and wherein said synchronizing means comprises a rotatable elongated drum common to both of said closed circuit systems.

4. The folding scaffold of claim 3 wherein biasing means is operatively connected to one of said extensible guide members to urge said extensible guide member to an extended position.

5. In a scaffold having a frame, a pair of platforms provided with laterally opposed outer edges and pivotally interconnected inner edges, said platforms being adapted for alternative movement from a first position of extension wherein the platforms are in substantial coplanar relationship and a second position of retraction wherein said platforms are angularly related to each other and said outer edges are laterally withdrawn, and power means to effect extension and retraction of said platforms, means to synchronize the movements of said platforms during extension and retraction, said synchronizing means comprising a pair of laterally opposed guide struts secured to the frame and extended upwardly and outwardly therefrom, the guide struts each providing a guideway defining a respective predetermined path of movement; an extensible guide member slidably received in each of said guideways and constrained to said respective path of movement, each member having an outer end pivotally connected to a respective platform at a

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point outboard from said pivotally connected inner edges; a pair of longitudinally spaced pulleys rotatably carried by the frame and operatively associated with each guide member; a cable trained over each pair of pulleys and secured to their respective extensible guide member as a closed circuit; and means interconnecting a rotatable member from each of closed circuit systems to effect synchronous movement of both extensible guide members.

6. A mobile scaffold comprising an elongated frame; a plurality of substantially identical support members mounted transversely in the frame in substantially parallel relation and in alignment longitudinally of the frame, each support member including a pair of crossed telescopically adjustable struts having spaced lower ends connected to the frame, rigidly interconnected central portions and divergently extended upper ends, each of the struts having an ear integral with the upper end thereof movable therewith between predetermined extended and retracted positions; a pair of substantially congruent platforms having widths substantially equal to the spacing of the upper ends of the struts when extended, pivotally interconnected inner edges disposed substantially midway between the upper ends of the struts, and oppositely extended outer edges; means pivotally supporting the platforms on the upper ends of the struts at positions substantially equally spaced from their respective inner and outer edges; an elongated drum rotatably mounted on the support members longitudinally of the frame adjacent to the intersection of the struts; an idler pulley mounted adjacent to the lower end of each strut; an endless cable individual to each strut connected to the ear of its respective strut, wrapped about the drum in driving-driven engagement therewith, and return traveled about the idler pulley of its strut whereby the struts are interconnected for corresponding free extension and contraction through the medium of the cables and drum; and controlled power means connected to the inner edges of the platforms for moving said inner edges upwardly and downwardly whereby upward movement of the inner edges causes the outer edges of the platform to pivot downwardly with all of the struts correspondingly retracting and downward movement of the inner edges causes the platforms to flatten with the struts correspondingly extending.

7. In a folding scaffold having a pair of platforms provided with laterally opposed outer edges and pivotally interconnected inner edges, said platforms being adapted for movement to and from a first extended position wherein the platforms are substantially horizontal and in coplanar relationship and a second retracted position wherein said platforms are angularly related to each other and said outer edges are disposed inwardly and downwardly from their extended position, a mobile frame, controlled power means interconnecting the frame and said platforms at said interconnected edges, supporting the platforms, and operable to effect movement to and from said extended and retracted positions; a pair of laterally opposed upwardly and outwardly projecting elongated extensible guide members, each having one end constrained to a predetermined path of movement and an opposite end pivotally connected to a respective platform, and means to synchronize extension and retraction of said guide members.

8. A scaffold comprising an elongated mobile frame; a pair of elongated platforms having inner edges in juxtaposition; pivot means interconnecting the platforms adjacent to said inner edges; first extensible strut means interconnecting the frame and said platforms at a point adjacent to said inner edges; at least one pair of laterally opposed second extensible strut means interconnecting the frame and each of said platforms respectively at points spaced from said inner edges and being extended incident to retraction of said first means; means constraining said extensible means to movement along a predetermined path of travel; power means to effect selective

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extension and retraction of said first strut means; and means to synchronize extension and retraction of said second strut means.

9. The scaffold of claim 8 wherein said second extensible strut means are connected to said platforms respectively at points substantially equidistantly spaced from said inner edges, and wherein said constraining means define for the individual laterally opposed strut means respective paths of travel which are outwardly upwardly

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divergent from each other and intersect at a point in a vertical plane containing said pivot means interconnecting the platforms.

References Cited in the file of this patent

UNITED STATES PATENTS

1,018,757	Grady	Feb. 27, 1912
2,003,581	Daly	June 4, 1935