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Butler

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[54] **LIFT MECHANISM**

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[52] **U.S. Cl.** **187/8.71;** 187/18; 254/104; 254/122

[51] **Int. Cl.** **B66f 7/08**

[58] **Field of Search** ..... 187/8.71, 18, 8.72; 254/122, 126, 104; 74/89, 99, 99 A

[56] **References Cited**

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[57] **ABSTRACT**

A scissors-type lift mechanism employs a reciprocating cam wedge adapted to engage cam follower rollers mounted on collapsed, transversely arranged scissor arms movable in the vertical plane. Movement of the cam in one direction forces the arms apart into a lifting movement as the rollers follow engaged cam surfaces. Movement of the cam in an opposite direction allows the scissor arms to collapse.

In a modified construction, slotted toggle links pivotally connected to the cam engage pins on the scissor arms to effect an additional arm-spreading or lifting action after an initial spreading action effected by the cam.

10 Claims, 6 Drawing Figures

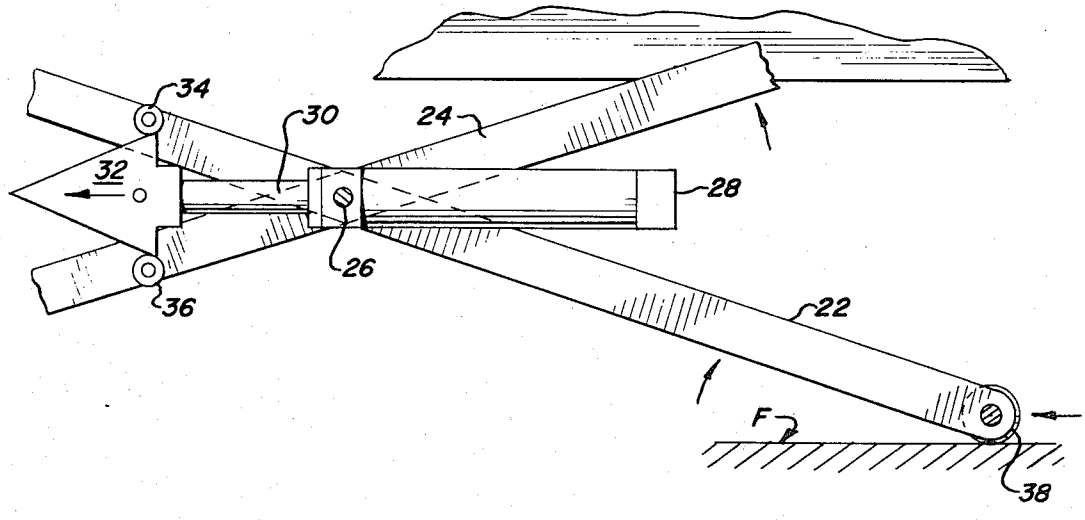


FIG. 1

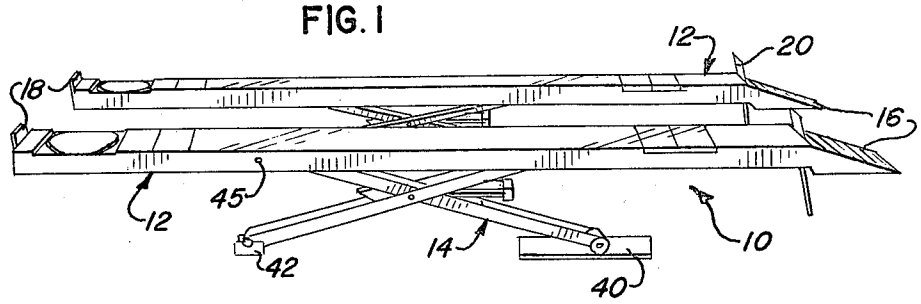
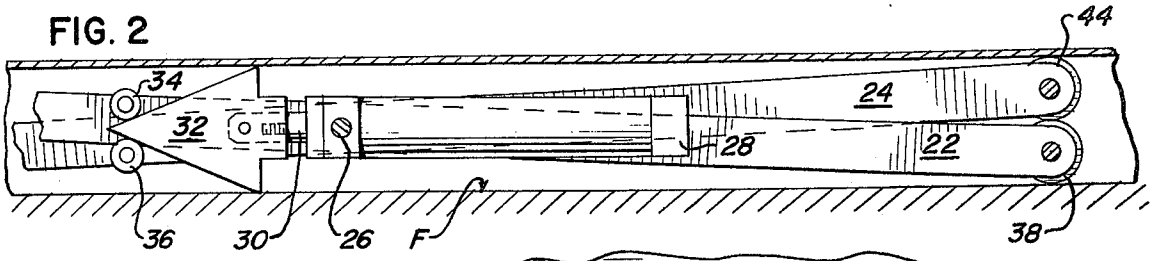


FIG. 2



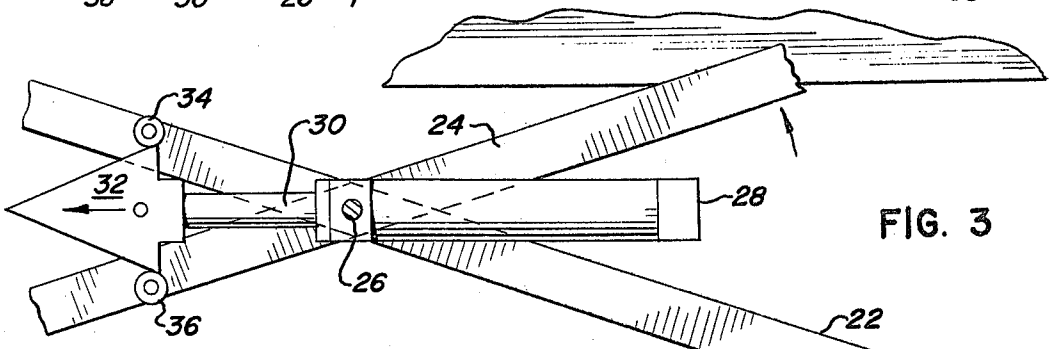


FIG. 3

FIG. 4

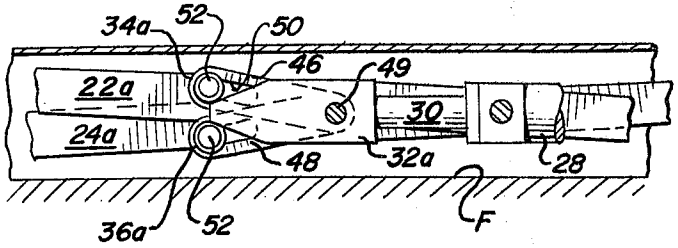


FIG. 5

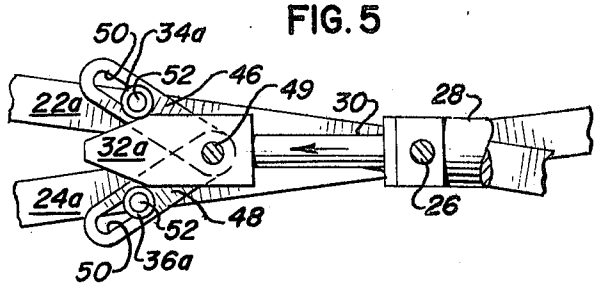
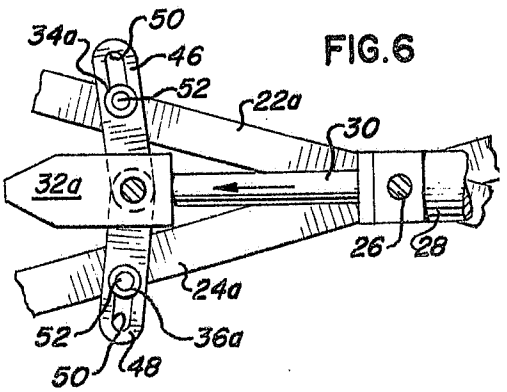


FIG. 6



LIFT MECHANISM

This invention relates to a scissors-type lift mechanism particularly adapted for use in the servicing of vehicles as by lifting automobiles or the like vertical distances.

The increasing costs pertaining to the purchase and maintenance of automobiles have impressed upon the auto-owning public in general the desirability of maintaining automobiles in peak operating condition. One of the more prominent areas in which constant vigilance is exercised by the typical auto owner is that of wheel alignment. Improper alignment results in rapid tire wear which necessitates early and costly tire replacement, and in the aggravated instances causes tread wear to the extent that the tires provide inadequate and unsafe traction.

Auto-lifting devices which provide a vertical lifting action facilitating a variety of servicing functions such as wheel alignment service, transmission service, exhaust system service, etc. are in ever increasing demand.

Many prior art automotive lifting devices comprising spaced runways are supported by a central supporting cylinder or include other apparatus between the runways and/or require subfloor installations. Such devices are costly to install, consume a maximum amount of valuable work area, and prevent access to the vehicle underside in the central area.

It is an object of this invention to provide an improved lifting device employing a simple scissor arm action and which may be used to raise automotive vehicles and the like vertical distances to provide access to, and thus facilitate servicing of, the vehicle wheels and underside.

It is another object of this invention to provide a novel lift mechanism which occupies a bare minimum of space in the collapsed and extended positions allowing maximum utilization to be made of the work area where installed. Yet the novel lift disclosed hereinafter allows ready access to substantially the entire vehicle undersurface when elevated.

It is a further object of this invention to provide a lift mechanism which is of novel design providing optimum mechanical efficiency in the elements employed so as to obtain maximum utilization of the power source employed. Said power source is thus maintained at a minimum size with resulting minimum purchase and maintenance costs.

The above and other objects of this invention will become more apparent from the following detailed description when read in the light of the drawing and the appended claims.

In one embodiment of this invention twin vehicle supporting runways disposed in spaced relation are supported atop two scissors-type lift mechanisms. The scissor arms of each lift are pivotally connected and operable in the vertical plane. The arms move from a lower position in which they are substantially horizontal in side-by-side relation to an upper extended position defining the maximum vertical lift of the runway supported by the upper ends of the scissor arms.

Cam follower rollers are mounted in superposed relation on the arms adjacent the pivot point of the transversely arranged scissor arms of each lift. A horizontally movable wedge cam spreads the cam followers apart forcing the arms to move about their pivot point while simultaneously causing the arm upper ends and runway supported thereon to rise in the vertical plane.

Slotted toggle links pivotally mounted on the cams afford additional arm-spreading action and runway lift in a modified construction hereinafter explained in greater detail.

FIG. 1 is a perspective view of a vehicle lift mechanism made in accordance with this invention in the elevated or lifting position;

FIG. 2 is a fragmentary sectional view illustrating lifting elements of the device of FIG. 1 in the collapsed condition housed within a runway member;

FIG. 3 is a fragmentary side view partly broken away illustrating the wedge cam of the provided lift in the extended position providing maximum lift;

FIG. 4 is a view similar to FIG. 2 illustrating a modified lift construction employing slotted toggle links;

FIG. 5 is a fragmentary side elevational view of the elements of FIG. 4 disposed in an initial stage of the lifting action, effected by means of the illustrated cam wedge; and

FIG. 6 is a view similar to FIG. 5 illustrating the position at which the toggle links of the illustrated lift elements complete their spreading action on the scissor arms.

Referring now to FIG. 1 a vehicle rack **10** is illustrated comprising spaced wheel supporting runways or tracks **12** each of which is supported by a scissors-type lift mechanism **14.** The tracks may employ usual inclined ends **16** to facilitate driving of the vehicle onto the tracks and fixed stops **18** at the opposed track ends as well as movable stops **20** which elevate into the stop positions illustrated with the elevation of the rack off a supporting floor surface.

In accordance with this invention a simple, unique cam-cam follower arrangement seen most clearly in FIG. 3 is employed to impart a spreading action to arms **22** and **24** of each twin lift mechanism **14.** Each arm **22** and **24** may assume the form of a U-shaped channel having opposed side flanges to facilitate the mounting of various roller members employed. The channels may be cut away in appropriate areas to allow the desired scissors action. Alternatively each arm **22** and **24** may comprise spaced strips or bars maintained in desired parallel relation by connecting transverse straps.

As noted in FIG. **3,** arms **22** and **24** are transversely arranged and pivotally connected at their centers by pin **26** which also serves as a mount for pivotally movable hydraulic cylinder **28.** Piston arm **30** is reciprocally movable in cylinder **28** and has cam wedge **32** disposed at the end thereof. Wedge **32** serves to spread apart scissor arms **22** and **24** as piston arm **30** extends from the cylinder by engaging vertically aligned rollers **34** and **36** rotatably mounted on scissor arms **22** and **24,** respectively. Aligned rollers **34** and **36** are preferably disposed as close to the pivot pin **26** as possible to afford the maximum spreading action during wedge movement with a resulting maximum lifting action.

As is also seen in FIG. **3,** the lower end of arm **22** of each mechanism **14** has a roller support **38** enabling the arm to travel over floor F in the course of lift elevation or retraction. Roller **38** may engage a travel plate such as plate **40** illustrated in FIG. **1.** The lower end of each arm **24** may be pivotally mounted in an anchor plate such as plate **42** of FIG. **1.** Roller **38** may be confined in a track (not illustrated) which prevents the possibil-

ity of upward movement from the supporting floor or plate.

As the scissor arms of each elevating mechanism **14** spread, rollers **44** (see FIG. 2) mounted on the upper ends of arms **24** rotatably engage undersurface portions of runways **12.** The rollers **44** are confined in guide tracks (not illustrated) to prevent disengagement from the engaged runways. The upper ends of scissor arms **22** may be pivotally anchored as by pins **45** seen in FIG. **1** to depending flange portions of runways **12.** FIG. **3** illustrates the cam wedge **32** in its maximum extended position relative to cylinder **28** and accordingly arms **22** and **24** are shown in their maximum spread-apart position.

Toggle links **46** and **48** illustrated in FIGS. **4** through **6** enable additional spreading action to be imparted to arms **22***a* and **24***a* of each twin lift mechanism after the cam wedge has initially spread the scissor arms. Each link **46** and **48** is pivotally mounted at one inner end on pin **49** of cam **32***a* and is slotted at **50** for lost-motion passage of pins **52** on which rollers **34***a* and **36***a* are mounted. The slots **50** enable the arms **22***a* and **24***a* to assume the spread position illustrated in FIG. **5** before the links become functional by engaging pins **52** at the inner ends of the slots **50.** In the position illustrated in FIG. **5** the thrust exerted on the pin **49** by the piston arm **30** will result in significant vertical force vectors being transmitted to the pins **52** and arms **22***a* and **24***a* to spread the pins vertically. Such vectors are minimal with the arms in the fully collapsed position of FIG. **4.**

FIG. **6** is illustrative of the arms **22***a* and **24***a* of a lift mechanism in the course of positively being spread apart by toggle links **46** and **48,** and near the maximum spread or lift position.

The links **46** and **48** are thus seen to provide an increased vertical displacement to the supported runways **12** while in no way increasing the depth of the disclosed lifting rack **10** in the collapsed condition; see FIGS. **2** and **4.**

The lifting apparatus in each embodiment occupies a minimum vertical space or vertical depth. This permits storage of the lift mechanism within the depth of a shallow track **12** on a flat floor surface. Moreover, the lifting action is effected by a simple reciprocatory drive motion of the piston rod **30** in each instance.

The pivotal cam and cylinder assembly is pivoted to remain substantially horizontal, since the cam portion thereof is "locked" between the rollers **34** and **36** regardless of the vertical interval between the rollers. Such horizontal disposition is present in both illustrated embodiments. Also, since the transversely arranged arms of each scissors lift are pivotally connected at their centers, the supported runways remain horizontal as they rise vertically, with no lateral shifting.

It should be noted that an additional benefit resulting from use of the disclosed apparatus is the complete open area between the runways which may be occupied by service personnel and/or equipment when the rack of this invention is in the elevated position.

It is apparent that the operating controls for the described lift mechanism are simple in nature and as a result have low initial cost and are inexpensive to maintain. Hydraulic fluid may be supplied to the cylinder **28** of each lift **14** to simultaneously raise the runways and may be similarly simultaneously released from such cylinders to retract the cam wedges **32** or **32***a* when it is desired to lower the runways. Auxiliary features known in the art may be employed with the devices above described such as safety supports which wedge between the runways and floor to guard against hydraulic failure.

It will be apparent to those skilled in the art that other modifications and embodiments of the specific apparatus disclosed herein may be made without departing from the spirit and scope of the invention. Particular construction and fabrication details of one embodiment are disclosed only by way of example, and the various components may be fabricated and assembled in other configurations. For instance, a single lift mechanism employing teachings of the invention and of appropriate dimensions may be utilized as an independent jack for other purposes.

It will be seen that improvements have been provided which meet the aforestated objects.

While a particular embodiment of this invention is shown and described herein, it will be understood, of course, that the invention is not limited thereto, since many modifications may be made by those skilled in the art, particularly in light of the teachings herein. It is contemplated, therefore, by the appended claims to cover any such modifications as fall within the true spirit and scope of this invention.

What is claimed is:

1. In a vehicle lifting rack the combination comprising a vehicle supporting runway, a collapsible scissors type lifting mechanism supportably engaging undersurface portions of said runway, said mechanism comprising transversely arranged, pivotally connected scissor arms movable in the vertical plane and assuming a substantially horizontal side by side relationship when in the collapsed condition, cam follower means disposed on each of said scissor arms whereby each arm follower means is arranged in vertically aligned adjacent relationship with every other cam follower means when said scissor arms are in the collapsed condition, cam means pivotally supported at the pivotal connection of said arms and movable substantially horizontally between said cam follower means, said cam means being adapted to force said cam follower means apart and thereby force said scissor arms to move about their pivotal connection so as to raise their upper ends; the upper ends of said scissor arms supportably engaging said runway.

2. The lifting rack of claim **1** in which said cam followers are rollers mounted on pins anchored in each of said scissor arms; said rollers being disposed adjacent the pivotal connection between said scissor arms.

3. The lifting rack of claim **2** in which said cam means comprises a wedge mounted on the end of a reciprocally movable piston rod extending from a cylinder, said cylinder being supportably mounted at the pivotal connection between said scissor arms.

4. The lifting rack of claim **2** in combination with slotted toggle links pivotally mounted on said cam means and having the slotted portions thereof slidably engageable with said pins while said cam means engages said cam followers; said slots being of such length that said cam means disengage from contact with said cam followers when said pins traverse the length of said slots whereafter cam movement forces said scissor arms to move about said pivotal connection by means of said toggle links as said toggle links pivot about said cam means.

5. An automotive lift rack comprising spaced lifting racks as described in claim 4 in combination with motive means for simultaneously raising and collapsing the scissor arms of each of said lifting racks.

6. The rack of claim 1 in which said cam means has a pointed end maintained between said cam follower means; in which movement of said scissor arms in the vertical plane causes vertical movement of said pivotal connection and corresponding pivotal movement of said cam means relative thereto; and in which said cam follower means are in vertical alignment and said cam means is disposed at substantially right angles thereto so as to be always substantially horizontal.

7. In a scissors type lift mechanism for imparting a vertical lift to a supported surface, the combination comprising transversely arranged scissor arms pivotally connected at their centers, having cam follower rollers mounted thereon which assume an adjacent relationship when said scissor arms are in a collapsed position, said rollers being in vertical alignment and disposed adjacent the pivot point of said arms when said scissor arms are in the collapsed condition, power driven cam means supported adjacent said cam followers adapted to spread said cam followers apart and simultaneously force said scissor arms to spread apart about their pivot point, said cam means having inclined surfaces adapted to move substantially horizontally to so force said rollers into spaced relation, and said scissor arms and the supported surface being so related that spreading action of the scissor arms imparts vertical movement to the supported surface.

8. The lift mechanism of claim 7 in combination with slotted toggle links pivotally mounted on said cam means and slidably engaging pins on which said rollers are mounted during said cam-roller engagement by means of said slots; said links being adapted to force said scissor arms further apart after said wedge has initially spread apart said scissor arms.

9. The lift mechanism of claim 7 wherein said power means includes a hydraulic cylinder supportably mounted at the pivot connection between said scissor arms, a reciprocally movable piston rod extending from said cylinder toward said cam followers, and said cam means being mounted on said piston rod and normally disposed between said pivot connection and said cam followers for engaging and forcibly spreading said followers upon outward movement of said cam means relative to said pivot connection.

10. An automative lift rack comprising a pair of spaced generally parallel lift mechanisms each as described in claim 7; said power driven cam means of each of said lift mechanisms including a hydraulic cylinder and reciprocable piston rod unit disposed beneath the respective supporting surface, and each having a cam member mounted on said piston rod; the space between said mechanisms being unobstructed; and hydraulic motive means for simultaneously actuating said cylinders for simultaneously raising and collapsing the scissor arms of said mechanisms.

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