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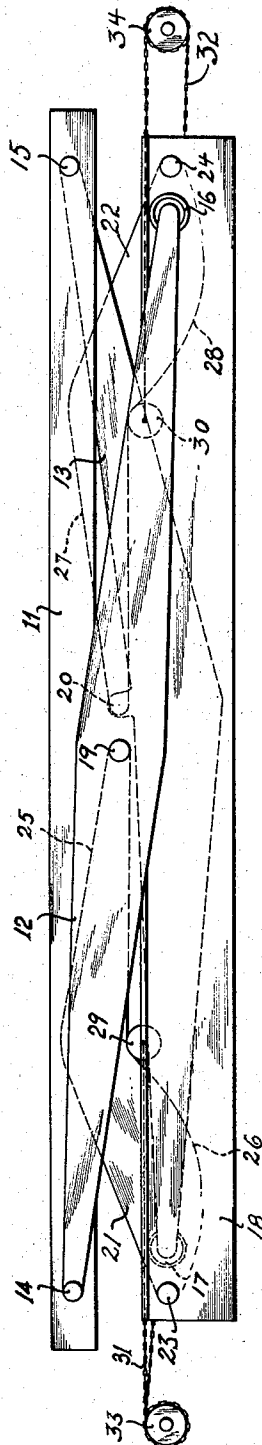
E. JAHNEL
LIFTING STAGE

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3 Sheets-Sheet 2

FIG. 2



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FIG. 3

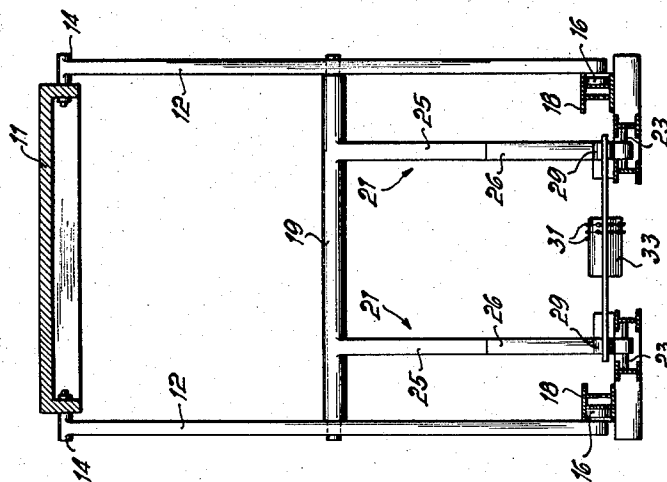
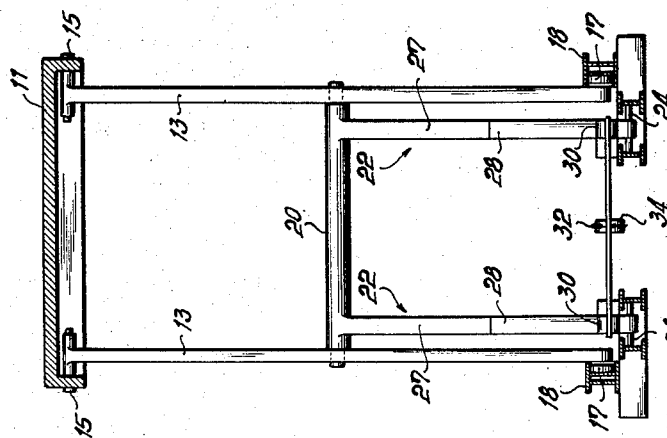


FIG. 4



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LIFTING STAGE

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8 Claims. (Cl. 187—8.72)

The present invention relates to a novel lifting stage. More particularly, it relates to a device of this character including a platform, suitable for supporting a vehicle or the like, and means for raising and lowering said platform at will.

Heretofore, lifting stages have been provided with a platform supported by sets of arms, the arms of each set being pivoted to each other at approximately their centers as in a scissors. In these stages, the distance between the tops of the arms of each set is variable and dependent upon the elevation of the platform. Consequently, the stability of such stage is dependent upon the elevation of the platform and is variable so that a load which is carried safely by the platform at minimum elevation is no longer carried with equal safety when the platform is raised.

In attempting to overcome this deficiency, lifting frames have been provided which suffer from the shortcoming of undesirable height even in the position of minimum elevation, with attendant increase in the storage space and manufacturing costs.

It is therefore an object of the present invention to provide a novel lifting stage wherein the platform can be collapsed to a desirable low minimum elevation, the platform being uniformly stable in all stages of elevation.

Another object of the invention is to provide a novel lifting stage of minimum height in collapsed condition.

A further object of the invention is to provide a lifting stage which is inexpensive to manufacture but which is nonetheless safe and easy to operate.

These and other objects are realized in accordance with the present invention which provides a platform with one or more sets of arms of equal lengths but different shapes. The arms are pivotally connected at their upper ends to the platform so that the upper ends of the arms are fixedly spaced apart and regardless of the elevation of the platform the distance between the upper ends of the arms is constant. The lower ends of the arms are capable of sliding along a horizontal guideway and are arranged to pass each other. For each arm, a lifting member is connected at one end to a fixed pivot and at the other end to the center of the arm. By causing the lifting members to swing about their respective fixed pivots, the upper ends of the arms are raised together with the platform. The lifting members are each provided with a curved portion which is acted upon by a thrust body in swinging the members about their respective fixed pivots. To avoid increasing the overall height of the lifting stage, which would otherwise be necessary because of the downwardly projecting curved portions of the members, these members are bent just beyond their curved portions.

The invention will now be described more fully with reference to a preferred embodiment shown in the accompanying drawings, wherein:

Fig. 1 is a lateral elevation of the stage in raised or elevated position;

Fig. 2 is a lateral elevation of the same stage in its lowered or collapsed position;

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Fig. 3 is a vertical section through the stage of Fig. 1 looking in the direction of arrows 3—3; and

Fig. 4 is a vertical section through the stage of Fig. 1 looking in a the direction of arrows 4—4.

Referring now more particularly to the drawings and first to Fig. 1, the lifting stage includes a platform 11 supported by at least one set or pair of arms 12, 13. If more than a single set of arms 12, 13 are provided they will be parallel to the set shown, and because they will lie directly beyond the first set in a plane parallel to that of the drawing they will not be visible in Fig. 1.

The upper end of each of the arms 12, 13 of each set is pivoted to the platform 11 by means of a pivot 14, 15, respectively, fixed to the platform 11 so that the distance between the upper ends of arms 12 and 13 of each set is constant. The lower end of each arm 12, 13 carries a roller 16, 17, respectively, which because of the weight of the platform 11, presses upwardly against the underside of the cross-piece of T-rail 18, as explained below, with the rollers 16 on the outside of the vertical member of the T-rail and rollers 17 on the inside of the rail 18, so that the rollers 16 and 17 may pass each other freely.

About axles 19, 20 midway between the ends of each arm 12, 13, respectively, there is pivoted the free end of a lifting bracket 21, 22, the other end of each bracket 21, 22 being fixedly pivoted at 23, 24, respectively. Preferably, the distance between pivots 19 and 23 of each lifting bracket 21 and between the corresponding pivots 20 and 24 of each lifting bracket 22 is equal to one half the distance between the upper and lower ends of the respective arms 12, 13.

From the foregoing, it will be seen that a linkage is provided wherein the centers of pivots 23 and 19 together with the center of roller 16 will always define an isosceles triangle, regardless of the position of elevation of the platform 11. A similar situation prevails with respect to the pivots 20, 24 and roller 17 at the right hand side of Fig. 1.

In addition, as can be seen in Figs. 3 and 4, the axes of pivots 23, 24 and of rollers 16, 17 all lie in a common horizontal plane. In the interest of stability, the axes of pivots 14, 15 lie directly above the axes of pivots 23, 24 so that these pivot axes define a rectangular parallelepiped.

Each bracket 21, 22 is composed of outer and inner portions 25, 26 and 27, 28, respectively, the inner or lower portions 26, 28 on their undersides being shaped as curvilinear arcs and cooperating with roller-type thrust bodies 29, 30 so that outward displacement of the thrust bodies 29, 30 away from each other in the directions indicated by the respective arrows causes the lifting brackets 21, 22 to be pivoted about their respective pivots 23, 24 thereby raising the arms 12, 13 and elevating the platform 11. The displacement of thrust bodies 29, 30 is effected by means of drag chains 31, 32 chain 31 leading directly to winding drum 33 while chain 32 first passes about a direction changing drum 34 and then to winding drum 33. The winding drum may be rotated by a source of rotary power such as a motor (not shown).

By paying out the chains 31, 32 to permit the thrust bodies 29, 30 to move toward each other, the brackets 21, 22 swing toward each other about their respective pivots 23, 24 thereby collapsing the structure to the position shown in Fig. 2. It can be seen that the pivot axle 19 of arm 12 abuts against the upper side of supporting arm 13 and thus if both arms were identical the arm 12 would be slightly elevated, thereby increasing the overall height in collapsed condition. To avoid such an increase in height, the supporting arms 12 and 13 are made dissimilar although in each instance the pivot axles 19, 20 are half-way between the ends of their respective arms. Specifically, the arm 13 is made slightly

obtuse with its pivot 20 resting in the apex at the median point between pivot 15 and roller 17, the apex being directed away from the adjacent edge of the arm 12.

Because the distance between the pivoted ends of each bracket 21, 22 is one-half that between the ends of each arm 12, 13 the guide rail 18 can be straight rather than curved. If a different relationship existed between the length of the arms and the members, the use of a rectilinear guide rail would result in blocking or impedance when attempting to raise the platform. Such blocking could then be overcome only by providing a curved rail which would accordingly result in an overall increase in the height of the rail.

The curvilinear arcs 26, 28 extend only along the lower half of brackets 21, 22, respectively, since if they extended the full distance between their pivoted ends the curve in collapsed position of the frame would project too far downwardly and would increase the overall height. By curving only a portion of brackets 21, 22 this is avoided. However, upper portions 25, 27 are bent off at an angle relative to their respective lower portions 26, 28 so that the humps in collapsed position (Fig. 2) represents the most elevated portions of the brackets 21, 22 and still do not project upwardly beyond platform 11.

Because the lower portions 26, 28 controlling the raising and lowering of the platform 11 are curvilinear, a given displacement of thrust bodies 29, 30 will always effect the same amount of rise of brackets 21, 22, i. e., for each foot which a thrust body 29, 30 moves, a bracket 21, 22 is raised a distance such as fifteen inches, for example. Thus, the configuration of the curved portions 26 and 28 of the lifting brackets 21 and 22 is shaped to provide increments of elevation for the platform 11 which are directly proportional to the corresponding horizontal outward displacements of the thrust bodies 29 and 30. Consequently, to raise the brackets 21, 22 and thus the platform 11 smoothly and continuously the expenditure of power by the motor (not shown) driving winding drum 33 will be constant. If portions 26, 28 were not curvilinear, to raise the brackets 21, 22, the first fifteen inches would require more power than raising it the next fifteen inches. The motor would of course have to be capable of delivering the maximum amount of horsepower. The novel formation therefore equalizes the power requirement of the motor and permits a smaller motor to accomplish the same job.

Various changes and modifications may be made without departing from the spirit and scope of the present invention and it is intended that such obvious changes and modifications be embraced by the annexed claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows. I claim:

1. A lifting stage of the class described, comprising in combination: an elongated base member; longitudinally extending guide means carried by said base member; an elongated platform member disposed above said base member; two sets of lifting arms of equal lengths, each set having upper end portions pivotally connected to said platform member by longitudinally spaced first pivot means fixed to said platform member and lower end portions slidably engaging said guide means; two sets of lifting bracket members of equal lengths, each set of lifting bracket members having pivoted end por-

tions connected to said base member by longitudinally spaced second pivot means and free end portions each connected to one of said sets of lifting arms by third pivot means each fixed to one of said sets of lifting arms intermediate the ends thereof, each of said sets of bracket members having lower curved surfaces; and power operable means displaceable longitudinally of said base member and engaging said curved surfaces to cause angular displacements of said bracket members about said second pivot means for selectively raising and lowering said platform member with respect to said base member.

2. A lifting stage according to claim 1, in which said guide means comprises a plurality of T-rails, said lower end portions of said lifting arms being provided with roller means which engage the undersides of the horizontal portions of said T-rails.

3. A lifting stage according to claim 2, wherein the roller means of each set of lifting arms are disposed on opposite sides of the upright portions of said T-rails, whereby the lower end portions of one set of lifting arms may pass the lower end portions of the other set of lifting arms freely during the raising and lowering of said platform member.

4. A lifting stage according to claim 1, in which said base member and said platform member are substantially coextensive and wherein said first pivot means are disposed directly above said second pivot means.

5. A lifting stage according to claim 1, wherein said third pivot means are disposed substantially at the mid-points of said sets of lifting arms whereby said second and third pivot means and the lower end portions of said lifting arms define isoscles triangles for all positions of elevation of said platform member.

6. A lifting stage according to claim 1, in which the free ends of said bracket members are spaced apart when said bracket members are simultaneously horizontally extended, one of said sets of lifting arms being recessed to accommodate the third pivot means fixed to the other set of lifting arms when said bracket members are horizontally extended.

7. A lifting stage according to claim 1, in which said curved surfaces of said sets of bracket members are shaped to provide incremental vertical displacements of said platform member which are directly proportional to corresponding incremental displacements of said power operable means longitudinally of said base member, whereby said platform member may be raised under load at constant velocity by the application of constant power to said power operable means.

8. A lifting stage according to claim 1, one set of lifting arms being recessed to receive the pivotal connections of the bracket members connected to the other set of lifting arms when the platform is in its lowered position.

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