Jan. 3, 1961 E. A. CAMPBELL ET AL 2,966,956

EXTENSION TOWER FOR USE WITH A FORK LIFT TRUCK

Filed Feb. 26, 1960 4 Sheets-Sheet 1

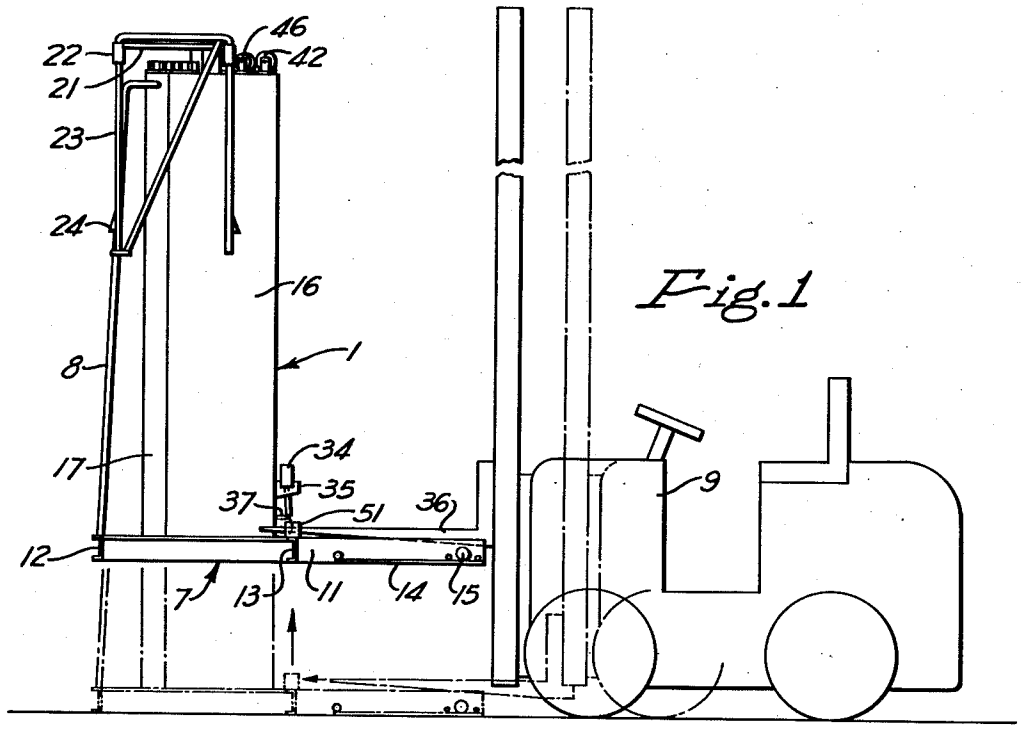


Fig. 1

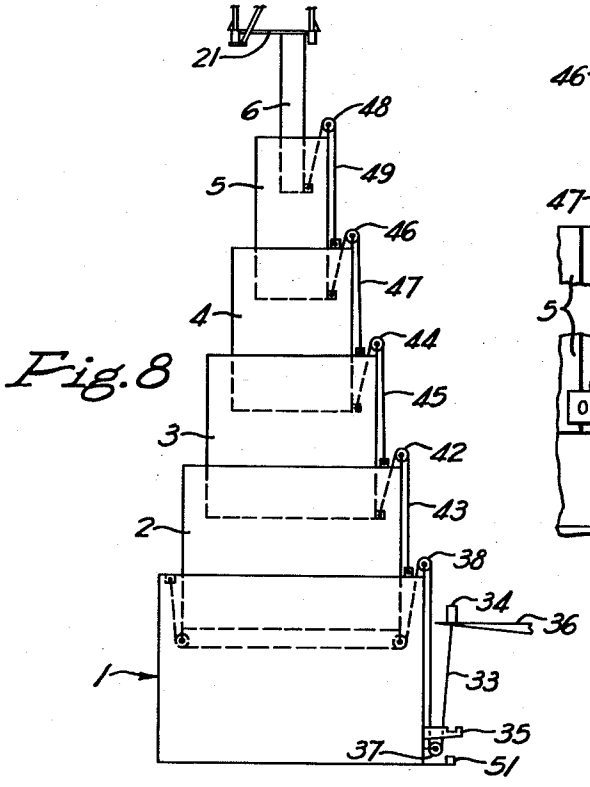


Fig. 8

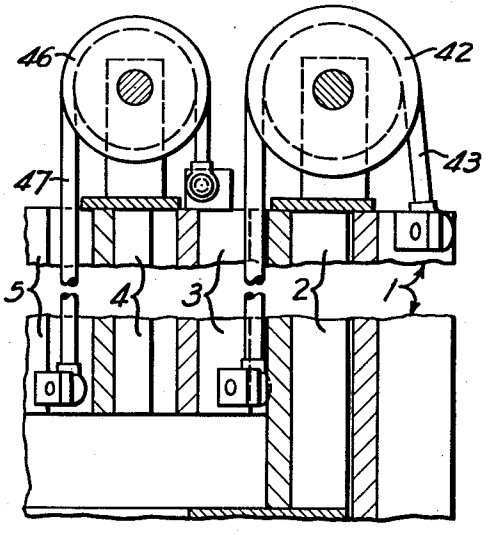


Fig. 7

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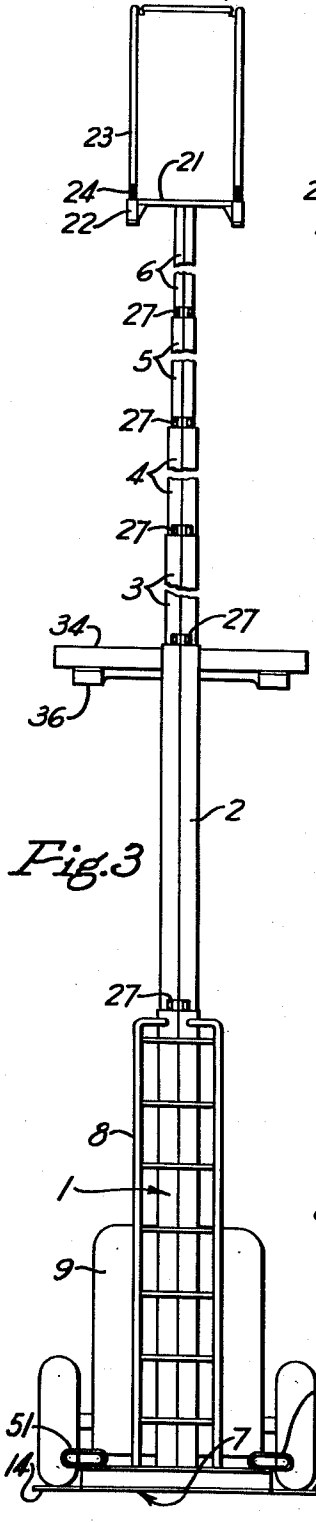


Fig. 3

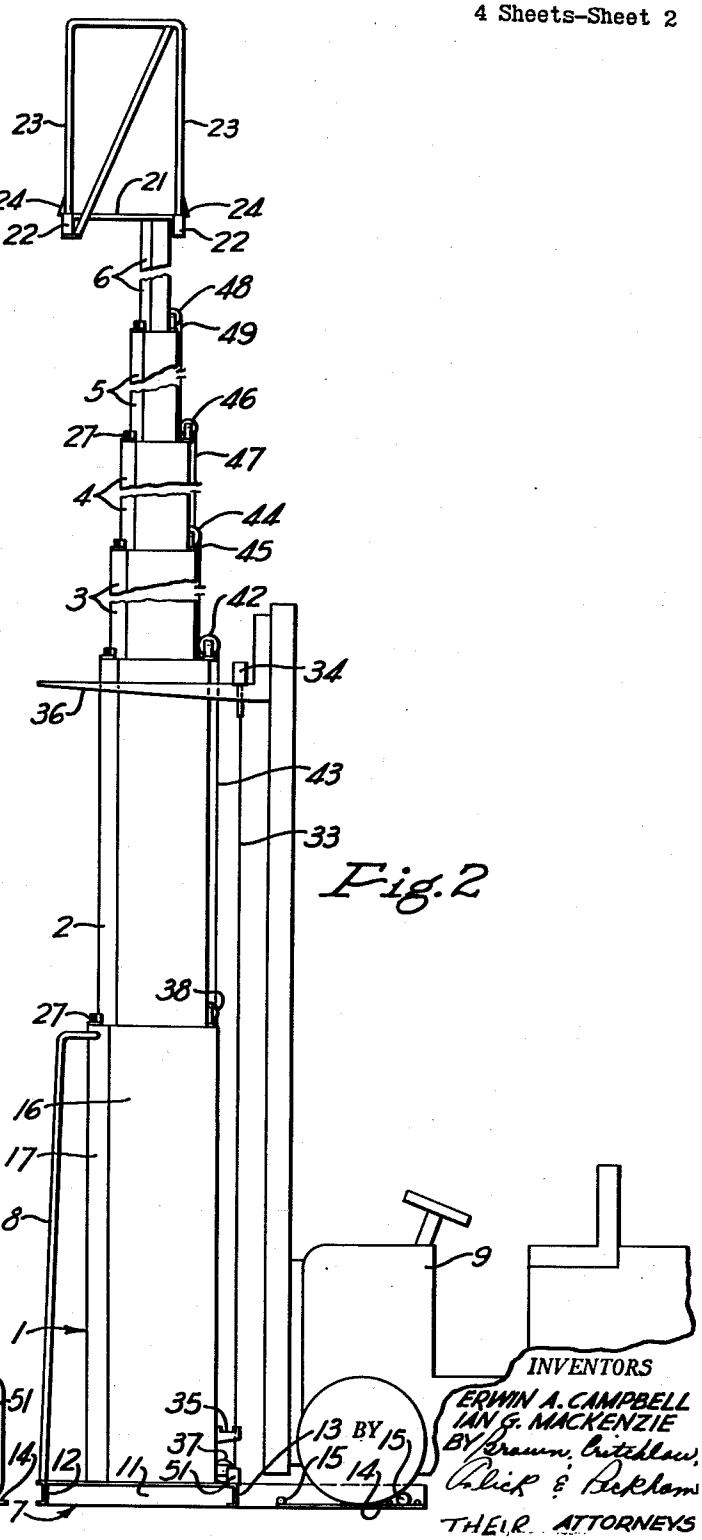


Fig. 2

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EXTENSION TOWER FOR USE WITH A FORK LIFT TRUCK

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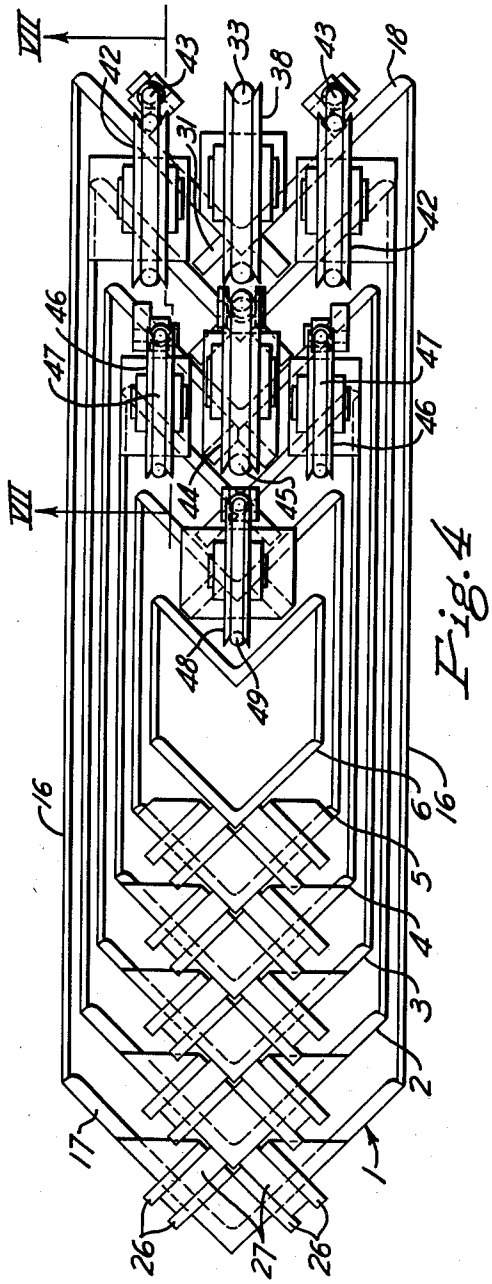


Fig. 4

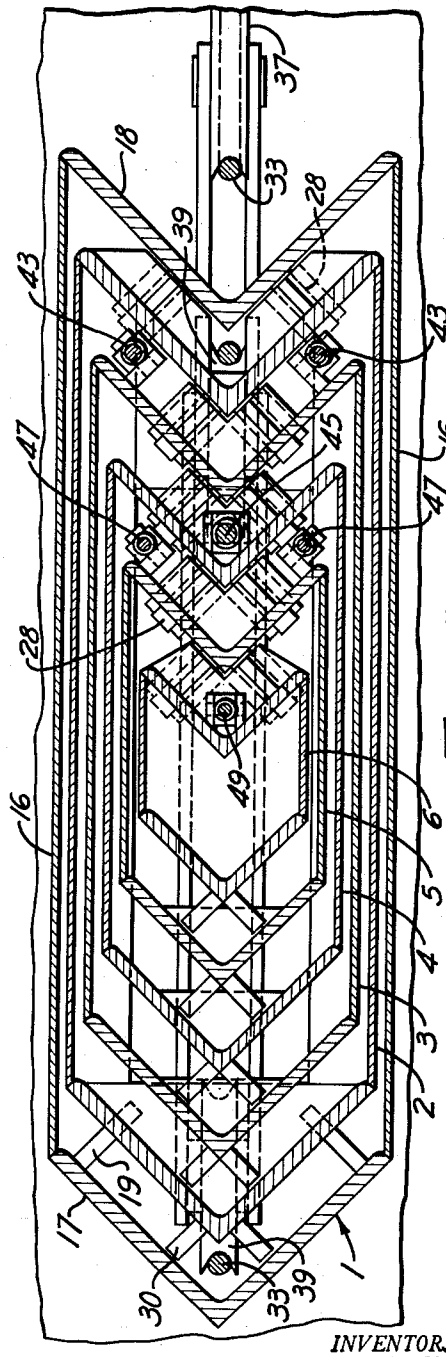


Fig. 5

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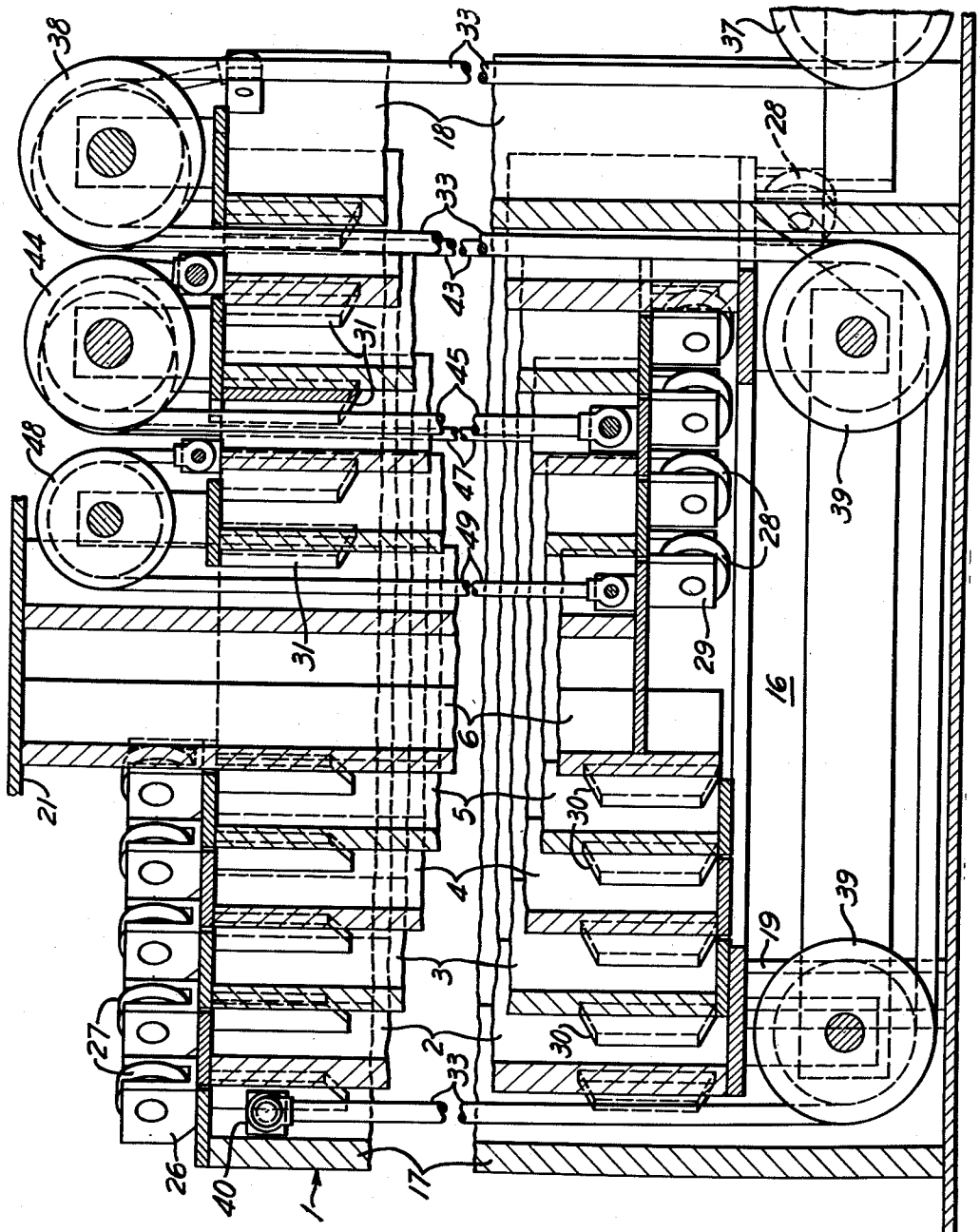


Fig. 6

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EXTENSION TOWER FOR USE WITH A FORK LIFT TRUCK

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8 Claims. (Cl. 182—63)

This invention relates to telescoping towers that can be raised and lowered, and more particularly to such a tower that can be transported and operated by a fork lift truck. Such towers may be used as scaffolding from the top of which work can be done on adjacent structures.

It is among the objects of this invention to provide an extension tower that does not include its own power machinery, that is especially designed for movement from one location to another by a standard fork lift truck, that uses the power of the truck for extending the tower, that is rigid and stable during use, and that is of simple and inexpensive construction.

In accordance with this invention a vertically extensible member is supported by a base, to which it is secured. The base extends away from one side of the extensible member and is formed to receive and support the front wheels of a fork lift truck while the truck fork is beside that member. Operatively connected with the extensible member is means for extending it when said means is raised by the fork while the truck is on the base. Preferably, a platform projects from the side of the top of the tower opposite to the side from which the base projects. With this arrangement, when the extensible member is formed from a series of telescoping vertical columns, antifriction guide means for the various columns are located only at the upper ends of the columns beneath the laterally projecting portion of the platform and at the lower ends of the columns at the opposite side of the tower.

The preferred embodiment of the invention is illustrated in the accompanying drawings, in which

Fig. 1 is a side view of the collapsed tower being transported by a fork lift truck;

Fig. 2 is a side view of the extended tower, with parts broken away;

Fig. 3 is a view of the front side of the raised tower;

Fig. 4 is an enlarged top view of the tower, with the platfrom absent;

Fig. 5 is a horizontal section through the collapsed tower;

Fig. 6 is a central vertical section through the collapsed tower with the central portion broken away;

Fig. 7 is a fragmentary section taken on the line VII—VII of Fig. 4; and

Fig. 8 is a diagrammatic view of the extended tower.

Referring to Figs. 1, 2 and 3 of the drawings, a vertically extensible member is formed from a series of hollow telescoping columns **1** to **6** nested one within another, with the bottom of the outer column **1** rigidly mounted on a base **7**. A ladder **8** may extend from the front end of the base up to the top of the outer column. It is permanently secured in place. The opposite or rear end of the base extends away from the columns far enough to permit the front wheels of a standard fork lift truck **9** to be run onto the base. The base may be formed from a pair of parallel longitudinal beams **11** rigidly connected at their front ends by a channel **12** and at their centers by a channel **13**. So that the front end of the truck will

not be raised an appreciable amount when it is on the base, it is preferred to mount tread plates **14** at the outer sides of the long beams **11**. These plates may be secured to heavy tie rods **15** that extend through the beams. The plates support the wheels of the truck.

The tower columns may be made in various ways, but it is preferred to make each one in the same way as outer column **1**, which, as shown in Figs. 4 and 5, is formed from two parallel side plates **16** connected at their front and rear edges by angular plates **17** and **18** that are V-shape in horizontal section. The plate **17** at the front side of the tower tapers forward and, in order to provide a space for a cable that is used in elevating the tower, the rear side plate **18** preferably is tapered in the same direction so that the column somewhat resembles an arrow in horizontal section. Column **2**, when in its lower position, seats on stops **19** resting on the base and welded to the front wall **17**.

Mounted on top of the inner column **6** is a suitable load support, such as a platform **21** shown in Figs. 1, 2 and 3, that may be provided at its corners with sleeves **22** in which the corner posts **23** of a railing are slidably mounted. While the tower is collapsed, the railing is in a lowered position relative to the platform, as shown in Fig 1. Before or after the tower is raised, the railing can be pulled up through the sleeves until spring latches **24** snap out over the top of the sleeves to support the railing in operative position.

To guide the tower columns in their vertical movements, antifriction means are provided, preferably in the form of rollers. Thus, as shown in Figs. 4 and 6, mounted in brackets **26** on top of the front side of each column, except the inner column, is a pair of guide rollers **27** that will be engaged by the angular sides of the front wall of the next smaller column as the tower is extended. It will be seen that each two rollers prevent movements of the adjoining column forward and laterally. For a reason that will appear presently, guide rollers are unnecessary at the bottom of the front walls and the top of the rear sides **18**, but similar guide rollers **28** (Figs. 5 and 6) are mounted in brackets **29** attached to the bottom of the rear side of each column, except the outer column. These bottom rollers are engaged by the adjoining column as the tower is extended.

By projecting the platform forward from the top of the inner or upper column as shown in Fig. 2, the weight of a man on the platfrom will tend to tilt the extended tower forward. This will press each column forward against the upper guide rollers **27** in front of it and backward against the lower guide rollers **28** behind it, so further guide rollers are not required. This is a big advantage, because it means that the columns will tightly engage all of the guide rollers and thereby avoid slack or play in the tower. If guide rollers had to be located at all four corners of each column, as would be the case if the loading on the tower were symmetrical, clearances would be required that would result in lateral movements of the columns as the man on the platfrom moved about. That would make the tower unstable and dangerous to use. Nevertheless, aligners in the form of lugs **30** may be welded to the front walls of the columns near their lower ends, and lugs **31** may be welded to the rear walls near their upper ends. They normally do not touch the adjoining columns, but will prevent any column from tilting backwardly a material amount accidentally.

In order to elevate or extend the tower, it is preferred to use cable means that include a lower cable **33**, the outer end of which is attached to means, such as a horizontal bar **34**, that normally rests on spaced supports **35** near the bottom of the back of the columns. When the fork lift truck is driven onto the base with the fork **36** in its lower position, the fork will move forward beneath the ends of the bar and straddle the columns. By then

elevating the fork in the usual way, it will lift the bar and that will pull on the cable and lift columns 2 to 6. This is because the cable extends from the bar down around a sheave 37 mounted near the bottom of the tower, up and over a sheave 38 mounted on top of the outer column, then down between the outer column and the next smaller one as shown in Figs. 6 and 8, across column 2 beneath sheaves 39 suspended from its bottom, and then up again between the outer column and the next smaller one to an anchor 40 secured to column 1 near its top. When the lifting bar is raised by the fork, the length of cable inside the outer column is shortened and that raises the rest of the columns.

At the same time, the remaining columns rise up out of one another because sheaves are mounted on their upper ends near their backs and support cables, each of which has its outer end secured to the upper part of the next larger column and its inner end secured to the lower end of the next smaller column. Since there is not enough room to place all of the sheaves in the same plane, two sheaves 42 are mounted on column 2 on opposite sides of sheave 38. They support cables 43. A single sheave 44 is mounted on column 3 and supports cable 45. Two sheaves 46 beside sheave 44 are journaled on column 4 for supporting cables 47. Finally, one sheave 48 on column 5 carries cable 49, the inner end of which is secured to the lower end of inner column 6. As each sheave is moved upward by its supporting column, that sheave causes the inner end of the cable over it to raise the next smaller column. Therefore, by raising the lifting bar only far enough to elevate the second column 2 in the bottom one, all of the rest of the columns will likewise be elevated simultaneously relative to one another as shown in Figs. 2, 3 and 8. In one specific example, a telescoping tower that is only about seven feet tall when collapsed, can be extended in this manner to a height of thirty-five feet.

After the tower has been lowered by lowering the truck fork and lifting bar 34, the truck can be backed off the tower base and then run forward again a short distance with the fork at a lower level to project its front end through loops 51 that are secured to the base. The entire tower then can be lifted from the ground by raising the fork as shown in Fig. 1. The loops are in such a position on the base that the tower will tend to tilt forward, but that is prevented by the rear end of the base engaging the bottom of the fork.

The extension tower disclosed herein can be used anywhere a fork lift truck is available for moving it and furnishing the power for raising it. Therefore, a special power plant for the tower does not have to be supplied, which reduces the weight and cost of the apparatus. The truck operator can pick up the tower, without leaving his seat, and transport it to another location. Also, he does not need to leave his seat in order to set the tower down again, apply the weight of the truck to the tower to steady it and then raise it to any desired height.

According to the provisions of the patent statutes, we have explained the principle of our invention and have illustrated and described what we now consider to represent its best embodiment. However, we desire to have it understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically illustrated and described.

We claim:

1. An extension tower comprising a base, a vertically extensible member supported by the base and secured thereto, said base extending away from one side of said member and formed to receive and support the front wheels of a fork lift truck while the truck fork is adjacent said member, and means operatively connected with said member for extending it when said means is raised, said means being adapted to be raised by said fork while the truck is on the base.

2. An extension tower comprising a base, a vertically extensible member supported by the base and secured thereto, said base extending away from one side of said member and formed to receive and support the front wheels of a fork lift truck while the truck fork is adjacent said member, cable means operatively connected with said member for extending it upon pulling the cable means, the cable means including a cable having an outer end near said base, and means connected to said outer end of the cable adapted to be raised by said fork while the truck is on the base to thereby pull the cable means.

3. An extension tower comprising a base, a vertically extensible member supported by the base and secured thereto, said base extending away from one side of said member and formed to receive and support the front wheels of a fork lift truck while the truck fork is straddling said member, cable means operatively connected with said member for extending it upon pulling the cable means, the cable means including a cable having an outer end near said base, and a horizontal bar connected centrally to said outer end of the cable adapted to rest across said fork and be raised by it to pull the cable means.

4. An extension tower comprising a base, a vertically extensible member supported by the base and secured thereto, a platform secured to the top of said member and projecting from one side of it, said base extending away from the opposite side of said member and formed to receive and support the front wheels of a fork lift truck while the truck fork is adjacent said member, and means operatively connected with said member for extending it when said means is raised, said means being adapted to be raised by said fork while the truck is on the base.

5. An extension tower comprising a base, a nest of telescoped columns supported by the base, means rigidly securing the bottom of the outer column to the base, a platform secured to the top of the innermost column and projecting forward from it above the other columns, said base extending away from the back of said outer column and formed to receive and support the front wheels of a fork lift truck while the truck fork is beside the columns, means operatively connected with said columns for extending the tower when said extending means is raised, said extending means being adapted to be raised by said fork while the truck is on the base, antifriction guide means supported by the upper end of the front of each column except said innermost column and engageable by the front of the next smaller column as the tower is extended, and antifriction guide means secured to the lower end of the back of each column except said outer column and engageable with the back of the next larger column as the tower is extended.

6. An extension tower comprising a base, a nest of telescoped columns supported by the base, means rigidly securing the bottom of the outer column to the base, a platform secured to the top of the innermost column and projecting forward from it above the other columns, said base extending away from the back of said outer column and formed to receive and support the front wheels of a fork lift truck while the truck fork is beside the columns, means operatively connected with said columns for extending the tower when said extending means is raised, said extending means being adapted to be raised by said fork while the truck is on the base, each of said sections having opposite sides connected by front and rear walls V-shape in horizontal section, a pair of rollers supported by the upper end of the front wall of each column except said innermost column and engageable by the converging sides of the front wall of the next smaller column as the tower is extended, and a pair of guide rollers secured to the lower end of the rear wall of each column except said outer column and engageable with the converging sides of the rear wall of the next larger column as the tower is extended.

7. An extension tower comprising a base, a nest of

telescoped columns supported by the base, means rigidly securing the bottom of the outer column to the base, said base extending away from one side of said outer column and formed to receive and support the front wheels of a fork lift truck while the truck fork is adjacent the columns, a sheave mounted at the top of one side of said outer column, a second sheave mounted below said first mentioned sheave near the base, a cable extending around the bottom of the base sheave and then up and over the first sheave and down between said outer column and the next smaller column, means operatively connecting the cable with the lower part of said next smaller column, means connected to the outer end of said cable and adapted to be raised by said fork to thereby pull the cable and elevate said next smaller column in said outer column, a sheave mounted at the top of each of the other columns except said innermost column, and further cables having their inner ends connected with the lower parts of said other columns, each further cable extending up and over the sheave on the next larger column, and means connecting the outer end of each further cable to the upper part of the next larger column, whereby when said next smaller column is elevated the other columns will be extended out of one another.

8. An extension tower comprising a base, a vertically extensible member supported by the base and secured thereto, said base extending away from one side of said member and formed to receive and support the front wheels of a fork lift truck while the truck fork is adjacent said member, means operatively connected with said member for extending it when said means is raised, said means being adapted to be raised by said fork while the truck is on the base, and means secured to the tower near its bottom for receiving said fork when the truck is not on said base, whereby the entire tower can be lifted up by the fork for transportation to another location.

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