April 5, 1966 C. W. BOPP 3,244,446

LIFTING FORK FOR SHEET MATERIAL

Filed Aug. 3, 1964 4 Sheets-Sheet 1

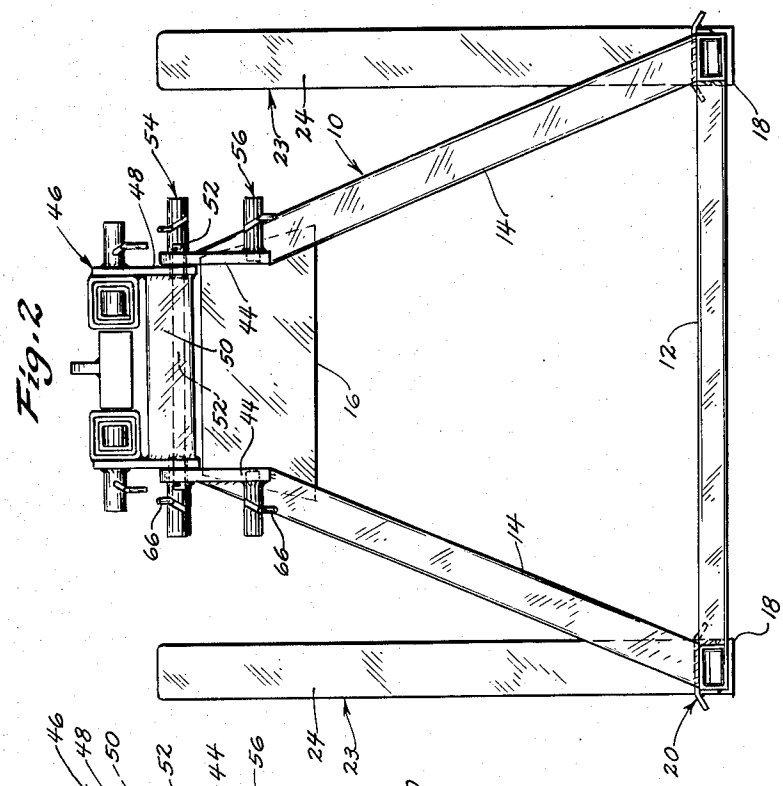

Fig. 2

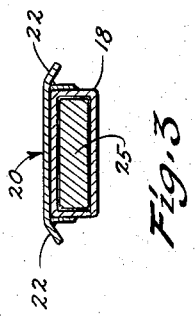

Fig. 3

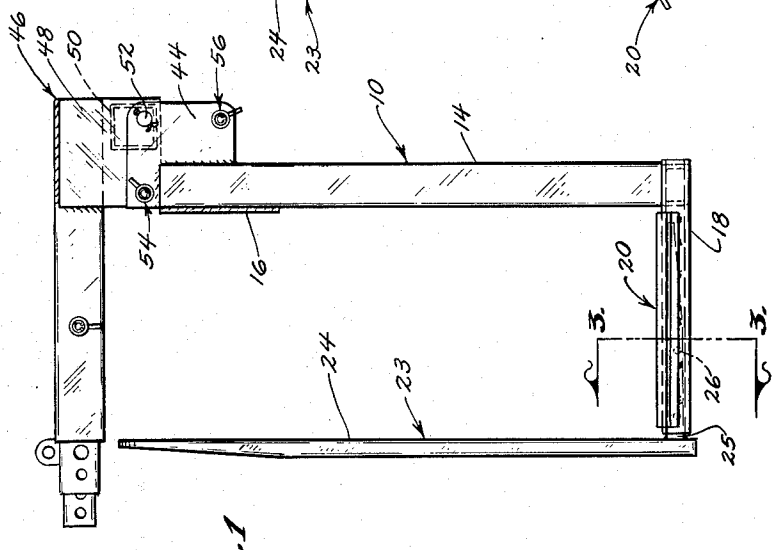

Fig. 1

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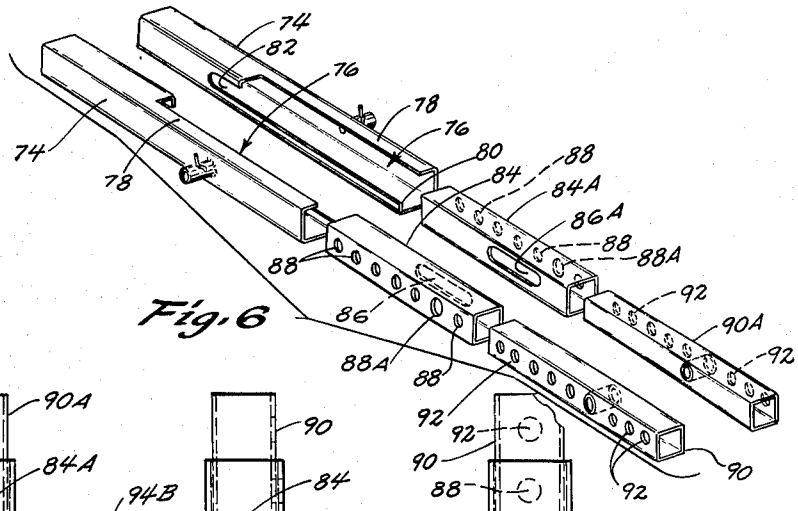

Fig. 6

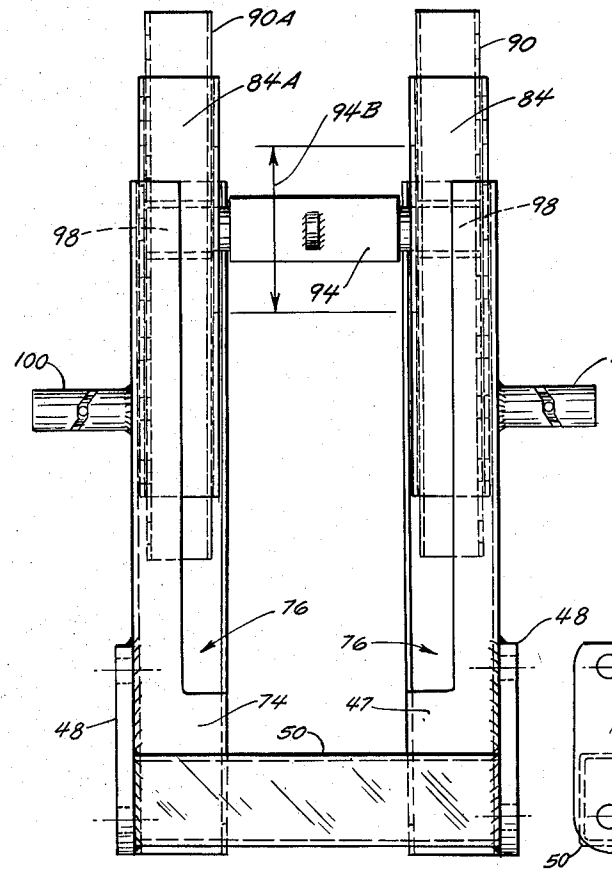

Fig. 4

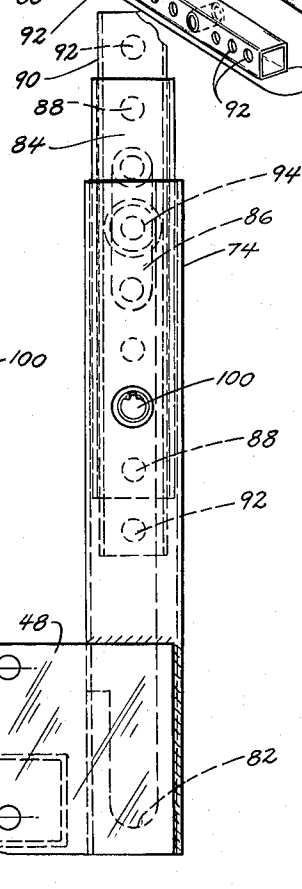

Fig. 5

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LIFTING FORK FOR SHEET MATERIAL

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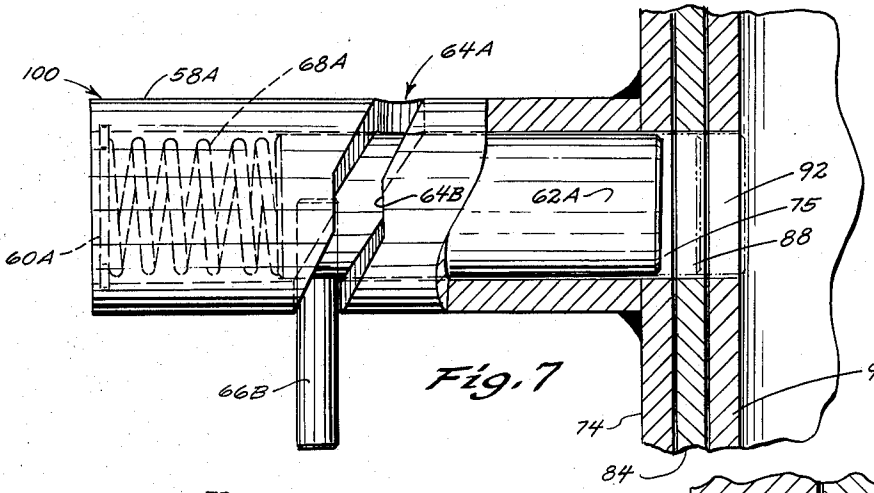

Fig. 7

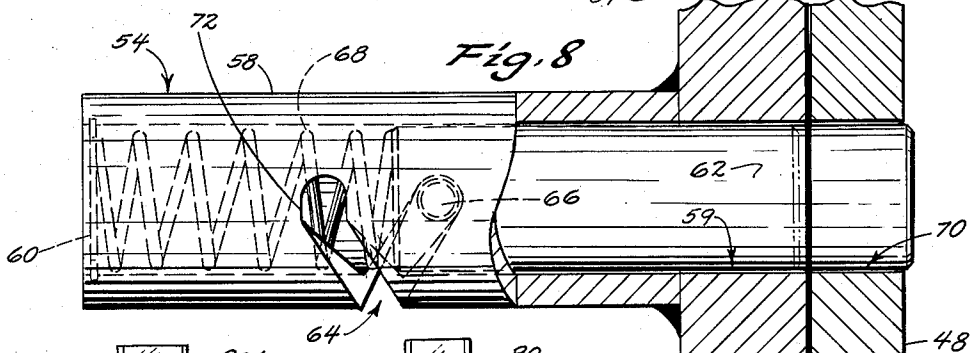

Fig. 8

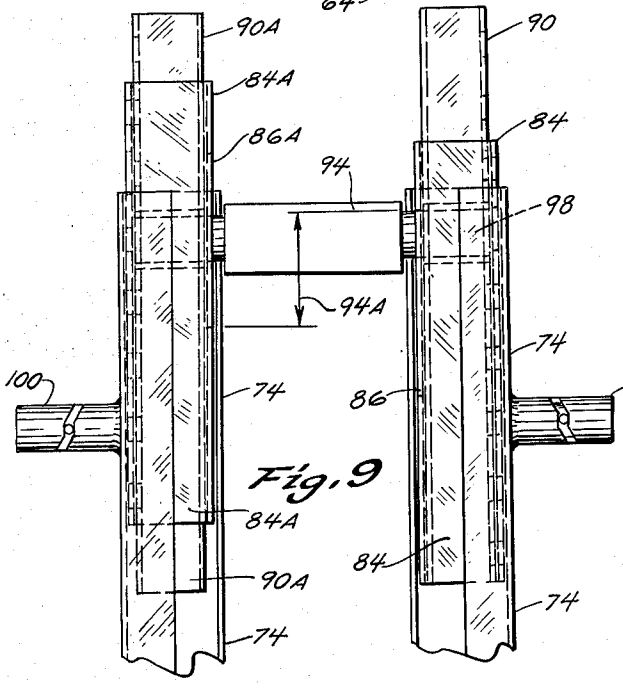

Fig. 9

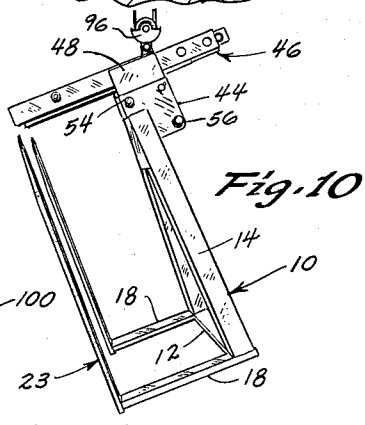

Fig. 10

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LIFTING FORK FOR SHEET MATERIAL

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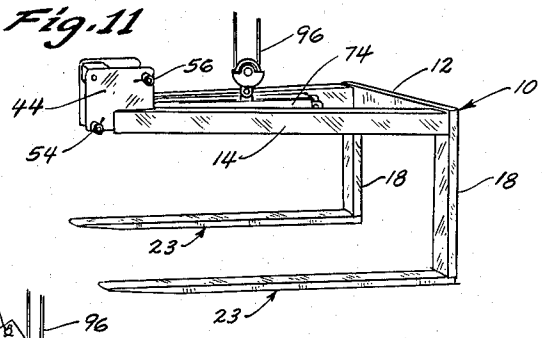
Fig. 11



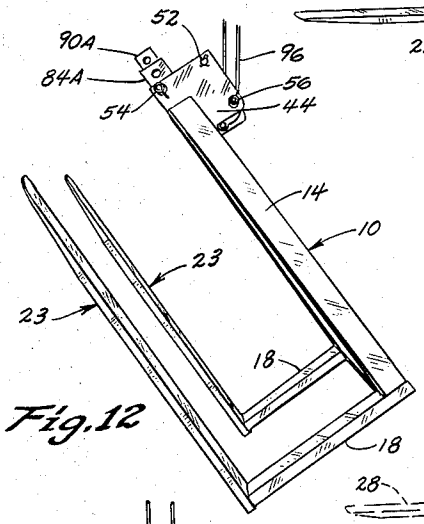
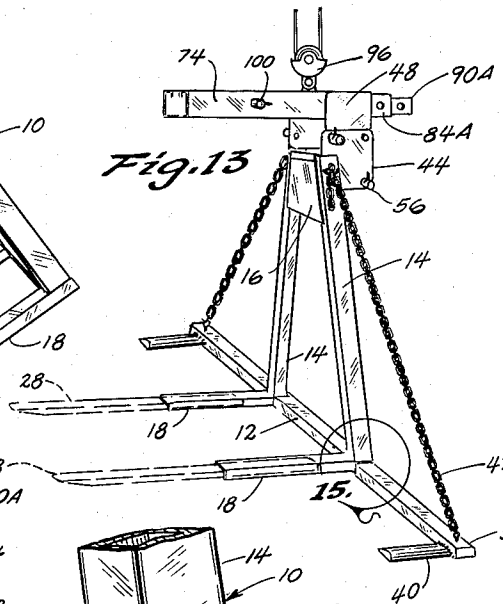


Fig. 12

Fig. 13



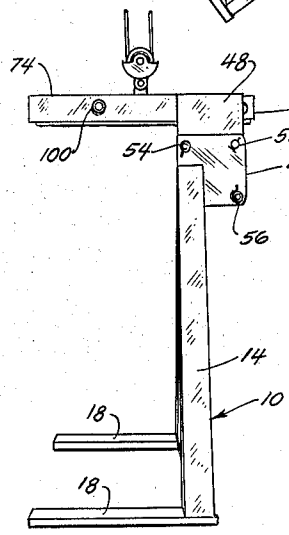


Fig. 14

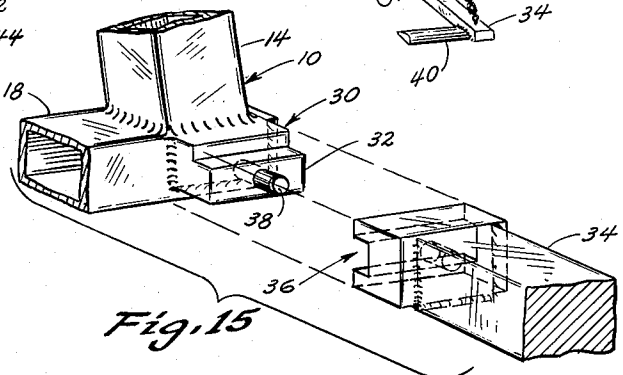


Fig. 15

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United States Patent Office 3,244,446 Patented Apr. 5, 1966

3,244,446
LIFTING FORK FOR SHEET MATERIAL

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Filed Aug. 3, 1964, Ser. No. 386,920
13 Claims. (Cl. 294—67)

This application is a continuation-in-part of application Serial Number 354,613 filed March 25, 1964.

The lifting and placing of plasterboard and plywood sheet material is often complicated by the narrow dimensions of window and door openings through which the sheets are to be moved. Lifting devices are available which can pick up a plurality of such sheets, but the size of these lifting units often makes them unsuitable for movement through openings of limited size. If these units can negotiate an opening of limited width, they often are therefore unable to also negotiate an opening of limited height.

Therefore, a principal object of this invention is to provide a lifting fork for sheet material which has a low profile and which is therefore adapted to move sheets of plasterboard and the like through narrow openings.

A further object of this invention is to provide a lifting fork for sheet material which can be selectively adjusted to move through either horizontal or vertical openings of narrow width of height, respectively.

A still further object of this invention is to provide a lifting fork for sheet material which can detachably receive tines of different shape to accommodate different loads and different loading conditions.

A still further object of this invention is to provide a lifting fork for sheet material that can be used to deposit a quantity of sheets on their side edges for purposes of leaning the sheets against a vertical wall.

A still further object of this invention is to provide a lifting fork for sheet material that will prevent any undue deflection of the sheets being lifted during the lifting operation.

A still further object of this invention is to provide a lifting fork for sheet material that will be substantially self-balancing in both its loaded and unloaded conditions, and which can have its self-balancing supporting means selectively adjusted.

A still further object of this invention is to provide a lifting fork for sheet material that is economical in manufacture, durable in use, and refined in appearance.

These and other objects will be apparent to those skilled in the art.

This invention consists in the construction, arrangements, and combination, of the various parts of the device, whereby the objects contemplated are attained as hereinafter more fully set forth, specifically pointed out in the claims, and illustrated in the accompanying drawings, in which:

FIGURE 1 is a side elevational view of the fork device in a position to be passed through a narrow vertical opening;

FIGURE 2 is an end view of the fork device of FIGURE 1;

FIGURE 3 is a sectional view of the tubular support arm as taken on line 3—3 of FIGURE 1;

FIGURE 4 is an enlarged scale plan view of the assembled supporting frame in one of its operating positions which afford maximum displacement of the lifting carriage;

FIGURE 5 is a side elevational view of the device of FIGURE 4;

FIGURE 6 is a schematic view of the sliding frame members of the supporting frame;

FIGURE 7 is an enlarged scale sectional view of one of the locking pin means for the sliding frame members;

FIGURE 8 is an enlarged scale sectional view of a locking pin means interconnecting the A-frame and the supporting frame;

FIGURE 9 is a plan view of the supporting frame similar to that of FIGURE 4 but with the sliding frame members in a second operating position;

FIGURE 10 is a perspective view of the fork unit in one of its operating positions;

FIGURE 11 is a perspective view of the fork unit in a second operating position;

FIGURE 12 is a perspective view of the fork device in a third operating position;

FIGURE 13 is a further perspective view of the fork device in a fourth operating position;

FIGURE 14 is a further perspective view of the fork device in a fifth operating position; and

FIGURE 15 is an enlarged scale schematic view of assembled structure designated at the arrow 15 of FIGURE 13 showing the detailed structure thereof.

An A-frame 10 is comprised of a normally horizontal bar 12 which has legs 14 which extend upwardly and inwardly from the end of bar 12. The upper ends of legs 14 are secured together by plate 16 which is secured to the legs by welding. Hollow arms 18 are rigidly secured to the ends of bar 12, and arms 18 extend perpendicularly therefrom in a plane ninety degrees from the plane of A-frame 10. A highly polished plate 20 with downwardly and outwardly extending flanges 22 (FIGURES 1 and 2) can be welded to the upper surfaces of the arms 18 to facilitate the movement of sheet material across the arms 18 without inflicting damage on the sheets. L-shaped tines 23 with lifting portions 24 and stub arms 25 are detachably secured to arms 18 with the stub arms 24 telescopically extending into the arms 18. Pins 26 (FIGURE 1) can be used to effect the connection therebetween. Alternate straight tines 28 can also be inserted into arms 18 as indicated by the dotted lines in FIGURE 13.

A block 30 (FIGURE 15) having a portion 32 of reduced thickness is welded to the lower side ends of A-frame 10. Bars 34 have recesses 36 in their inner ends which are adapted to receive the portions 32 on blocks 30. A pin 38 on blocks 30 is adapted to extend into a corresponding aperture in the bottoms of recesses 36. Stub arms 40 are welded to the ends of bars 34 and extend outwardly (FIGURE 13) in a direction parallel to arms 18. Chains 42 are secured to the outer ends of bars 34 and are adjustably secured to the top side portions of A-frame 10 by any convenient means.

Plates 44 are welded in spaced apart relation to the upper end of A-frame 10 and extend rearwardly therefrom as viewed in FIGURE 1. A supporting frame 46 includes a pair of plates 48 which dwell in planes just adjacent to the inward surfaces of plates 44. A square tube 50 has its ends welded to plates 48 and shaft 52 extends therethrough and has its ends rotatably journaled in suitable apertures in the upper rearward corners (FIGURE 1) of plates 44. Cotter keys or the like in the outer ends of shaft 52 maintain this connection.

Apertures appear in the forward upper corners and lower rearward corners of plates 44 (FIGURE 1) and spring loaded pin means 54 and 56 are mounted thereover. These pin means 54 and 56 are identical and are best illustrated in FIGURE 8. A sleeve 58 is welded over the aperture 59 in plate 44, and a plug 60 closes the outer end of the sleeve. Pin 62 is slidably mounted in the sleeve 58 and a spirally-shaped slot 64 appears in the sleeve adjacent the outer end of the pin. Lever 66 is rigidly secured to the outer end of pin 62 and extends through slot 64. Coil spring 68 is positioned in sleeve 58 between plug 60 and the outer end of pin 62 to normally urge the pin inwardly into the aperture 59 and an aper-

ture 70 in plate 48 which registers therewith at times. A notch 72 in the outermost end of slot 64 maintains pin 62 in this outermost position. Manual rotation of lever 66 to the opposite end of slot 64 will withdraw pin 62 from these apertures, and spring 68 will thereupon become compressed. FIGURE 1 shows pin means 54 effecting the lock between plates 44 and 48. By releasing the lock means 54 in the manner described, plates 48 (and supporting frame 46) can be rotated 270 degrees to the position of FIGURE 11 so that the supporting frame 46 dwells within and bisects the A-frame 10. The apertures in plates 44 which were aligned with pin means 54 when the device was in the position of FIG. 1 are aligned with pin means 56 when the device is in the position of FIG. 11. Pin means 56 are inserted into these apertures to maintain the device in the position of FIG. 11.

Elongated square tubes 74 are welded at one end to the inner faces of plates 48 at a point below tube 50, and tubes 74 extend transversely from the tube 50. Portions of tubes 74 are cut away at 76 leaving a horizontal top flange 78, an inner bottom side flange 80, and a slot 82 on the inner side face of the tubes 74. (FIGURE 6.)

Intermediate square tubes 84 and 84A are slidably mounted in the outer open ends of tubes 74. Each of the tubes 84 and 84A has an elongated slot 86 and 86A on their respective inner side faces, and these slots are normally about five inches long. A plurality of apertures 88 appear in the outer side faces of tubes 84 and 84A, and the enlarged aperture 88A is positioned exactly opposite the outer end of slots 86 and 86A.

Inner square tubes 90 and 90A, are slidably mounted within intermediate tubes 84 and 84A, respectively. Inner tubes 90 and 90A have a plurality of apertures 92 in their outer side faces which are adapted to register at times with the apertures 88 in intermediate tubes 84 and 84A. A carriage means 94 suitable for connection to a lifting means 96 is pivotally secured to the inner tubes 90 and 90A by means of suitable bearing elements 98. (FIGURES 4 and 9.) The carriage means 94 extends between the inner faces of the inner tubes, and this is made possible by the elongated slots 86 and 86A in intermediate tubes 84 and 84A, respectively. The carriage means 94 slidably extends through these slots 86 and 86A.

Locking pin means 100 are mounted on the sides of tubes 74 over suitable apertures 75 and are adapted to selectively lock the intermediate and inner tubes in predetermined positions as will be discussed hereafter. The parts of pin means 100 substantially correspond to those parts of locking pin means 54 and 56, except as described hereafter, and the suffix "A" has been added to those corresponding parts of pin means 100 which relate to the means 54 and 56. It should be noted that the central portion of slot 64A has a flat portion 64B to permit pin 62A to be held in an intermediate position where tubes 74 will be locked to the intermediate tubes 84 and 84A, but the inner tubes 90 and 90A will have limited sliding movement within the intermediate tubes.

The normal operation of the fork unit is as follows: With reference to FIGURE 11, the supporting frame 44 can be pivoted to the position shown in the manner described above and then locked in this position by pin means 56. The locking pins 100 on tubes 74 are actuated in the manner described to lock the intermediate tubes 84 and 84A thereto, but to permit the inner tubes 90 and 90A to have the sliding movement defined by the slots 86 and 86A in the intermediate tubes. When the fork is to be used in the position shown in FIGURE 11, it is preferred that the pinning of the intermediate tubes 84 and 84A be staggered as shown in FIGURE 9, which will locate the innermost end of slot 86A opposite the center of slot 86, and the outermost end of slot 86 will be opposite the center of slot 86A. If the length of the slots 86 and 86A is five inches, the carriage 94 will

thereupon have a total sliding displacement within the slots of two and one-half inches. (See arrow 94A in FIGURE 9.) The balanced position for the fork unit in a loaded condition will find carriage 94 in its outermost position against the outer end of slot 86 (FIGURE 9) and the fork will remain balanced when unloaded as the carriage slides to the innermost position adjacent the inner end of slot 86A. If the boom operator wishes to move the fork unit of FIGURE 11 through an opening at an angle of about 45 degrees, the intermediate tubes 84 and 84A, along with the inner tubes 90 and 90A can be slidably moved outwardly towards the ends of tines 23 in tubes 74 and pinned in this outward position. This automatically places the fork unit in the "out of balance" forty-five degree angle shown in FIGURE 12. Different angles can be acquired by using the pin 62A of locking means 100 in different apertures in the intermediate and inner tubes. It should be noted that the intermediate tubes 84 and 84A can be pinned either with or without the inner tubes 90 and 90A by adjusting the locking pin 62A of the locking means 100 (FIGURE 7). The positions of the fork in FIGURES 11 and 12 depict the positions when low profile openings are encountered. It will be appreciated that the lifting boom will be at a point very close to carriage 94 as the fork is being inserted through an opening.

Access of the fork through a narrow opening will require that the A-frame be placed in the vertical position of FIGURE 1. The intermediate tubes 84 and 84A are preferably pinned in the position shown in FIGURE 4 which will align the slots 86 and 86A, thus giving the carriage 94 five inches of sliding displacement between an outer balanced position under loaded conditions (see arrow 94B in FIGURE 4), and an inner balanced position under empty conditions. By moving the inner and intermediate tubes toward and over the top of A-frame 10 as depicted in FIGURE 10, the angular position of the A-frame can be attained if such an angle is desired rather than the upright position illustrated in FIGURE 1.

If the boom operator wishes to place a stack of sheet material on its side edge adjacent a wall structure, a stack of sheet material on the fork unit of FIGURE 1 is strapped in any convenient fashion to the A-frame 10, and the tines 23 are removed, thus leaving the fork unit of FIGURE 14. The stack of sheet material is then lowered onto suitable pallet elements (such as 2" x 4" strips of lumber), the strap is removed, the top of the stack is pushed to engagement with the wall, and the fork is then withdrawn from underneath the stack.

When unusually large sheet material is being lifted, it is desirable to attach the bars 34 (FIGURES 13 and 15) to the sides of the A-frame 10, and the elements 40 thereof will engage the underside of the sheets at the outer side edges thereof, which will eliminate the likelihood that the sheets will suffer damage because of undue bending. In this usage, L-shaped tines 23 will be removed and the straight tines 28 (FIGURE 13) will be employed.

Thus, from the foregoing, it is seen that the device of this invention will accomplish at least all of its stated objectives.

Some changes may be made in the construction and arrangement of my lifting fork for sheet material without departing from the real spirit and purpose of my invention, and it is my intention to cover by my claims, any modified forms of structure or use of mechanical equivalents which may be reasonably included within their scope.

I claim:

1. In a lifting fork apparatus,

a frame means,

supporting arms secured to one end of said frame means and extending outwardly therefrom,

a supporting frame pivotally secured to the other end

of said frame means and being adapted to pivot from a first position at right angles to said frame means to a second position parallel to said frame means,
means for selectively pinning said supporting frame in said first or second positions,
a carriage means movably mounted on said supporting frame and being adapted to be connected to an overhead lifting device,
limiting means on said supporting frame for limiting the length of travel of said carriage means,
and means on said supporting frame for selectively adjusting the length of travel of said carriage means with respect to said limiting means.

2. In a lifting fork apparatus,
frame means,
supporting arms secured to one end of said frame means and extending outwardly therefrom,
a supporting frame pivotally secured to the other end of said frame means,
releasable locking means for selectively pinning said supporting frame in different pivotal positions with respect to said frame means,
a carriage means movably mounted on said supporting frame and being adapted to be connected to an overhead lifting device,
and means on said supporting frame for adjusting the length thereof to vary the position of said carriage means thereof.

3. In a lifting fork apparatus,
a frame means,
supporting arms secured to one end of said frame means and extending outwardly therefrom,
a supporting frame pivotally secured to the other end of said frame means,
releasable locking means for selectively pinning said supporting frame in different pivotal positions with respect to said frame means,
a carriage means movably mounted on said supporting frame and being adapted to be connected to an overhead lifting device,
limiting means on said supporting frame for limiting the length of travel of said carriage means,
and means on said supporting frame for selectively adjusting the length of travel of said carriage means with respect to said limiting means.

4. In a lifting fork apparatus,
a frame means,
supporting arms secured to one end of said frame means and extending outwardly therefrom,
a supporting frame pivotally secured to the other end of said frame means,
releasable locking means for selectively pinning said supporting frame in different pivotal positions with respect to said frame means,
a carriage means movably mounted on said supporting frame and being adapted to be connected to an overhead lifting device,
limiting means on said supporting frame for limiting the length of travel of said ca rriage means,
means on said supporting frame for selectively adjusting the length of travel of said carriage means with respect to said limiting means,
and means on said supporting frame for adjusting the length thereof to vary the position of said carriage means thereon.

5. In a lifting fork apparatus,
a frame means,
supporting arms secured to one end of said frame means,
a supporting frame pivotally secured to the other end of said frame means,
releasable locking means for selectively locking said supporting frame in different angular positions with respect to said frame means,
a carriage means movably secured to said supporting frame and being adapted for connection with an overhead lifting means,
said supporting frame including telescopically interconnected frame members,
and locking means on said frame members for selectively adjusting the length of said supporting frame and the position of said carriage means thereon.

6. The device of claim 5 wherein said lifting fork apparatus includes limiting means on said supporting frame for limiting the length of travel of said carriage means and means on said supporting frame for selectively adjusting the length of travel of said carriage means with respect to said limiting means.

7. The device of claim 5 wherein said supporting frame includes two spaced apart sets of telescopically interconnected tubular members, with locking means secured to said tubular members to selectively limit and adjust the relative positions of the tubular members in each set.

8. The device of claim 5 wherein said supporting frame includes two spaced apart sets of telescopically interconnected tubular members, with locking means secured to said tubular members to selectively limit and adjust the relative positions of the tubular members in each set; said carriage means being movably mounted in an elongated slot on a tubular member in each set of tubular members.

9. The device of claim 5 wherein the telescopically interconnected frame members include a first pair of spaced apart tubular members, an intermediate pair of tubular members telescopically mounted in said first pair, an inner pair of tubular members telescopically mounted in said intermediate pair, a plurality of registering apertures in said intermediate and inner pairs of tubular members, releasable locking means on said first pair adapted to selectively enter said apertures to lock said first pair to said intermediate and said inner pairs, an elongated slot in each of the tubular members of said intermediate pair and said carriage means extending through said slots and being connected to the tubular members of said inner pair.

10. The device of claim 5 wherein bar members extend laterally outwardly from the other end of said frame means at substantially right angles to said supporting arms, chain members interconnecting the top of said frame means and the outer ends of said bar members, and stub arms are secured to the outer ends of said bar members and extend in substantially the same direction as said supporting arms.

11. The device of claim 5 wherein tine members are detachably mounted in said supporting arms.

12. The device of claim 5 wherein L-shaped tine members are detachably mounted in said supporting arms.

13. The device of claim 5 wherein said releasable locking means can lock said supporting frame in only two positions on said frame means, said two positions being 270 degrees apart.

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