Sept. 22, 1953 M. E. BURCH 2,652,939

TRACTOR MOUNTED GRAB DEVICE FOR HAY AND THE LIKE

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FIG. 1.

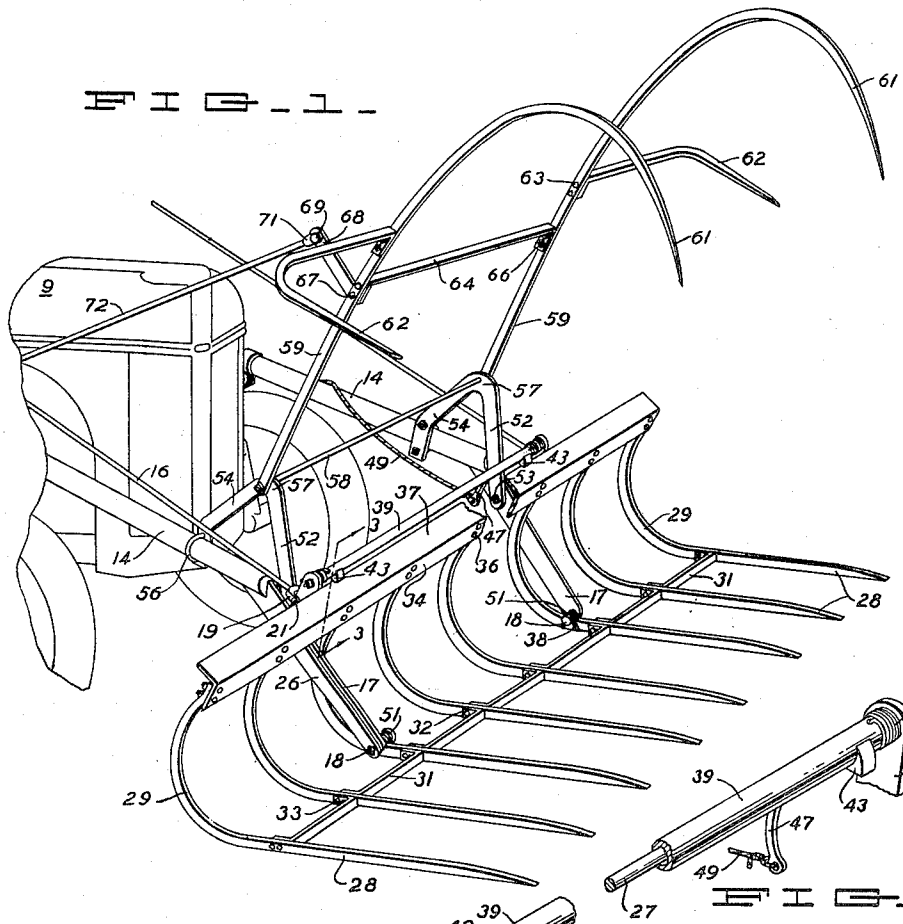


FIG. 5.

FIG. 2.

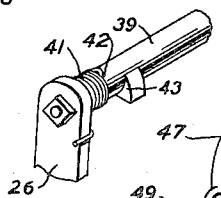
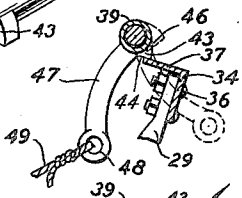


FIG. 3.



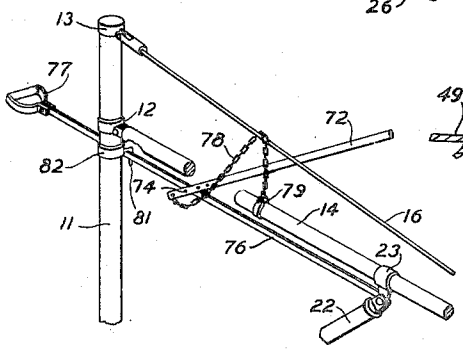
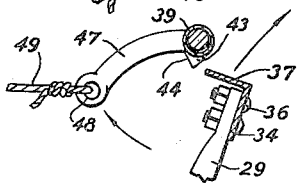


FIG. 4.

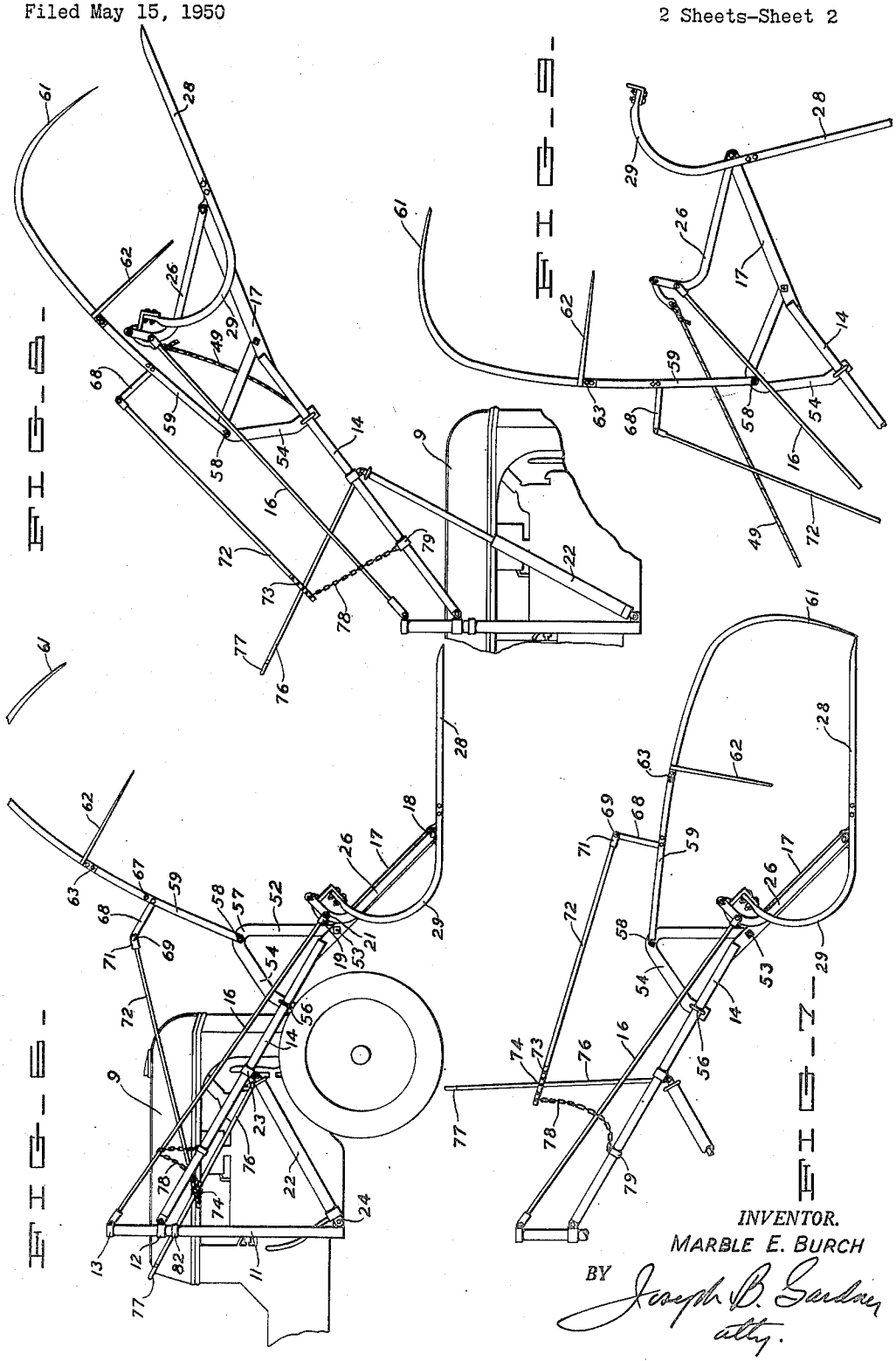


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TRACTOR MOUNTED GRAB DEVICE FOR HAY AND THE LIKE

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UNITED STATES PATENT OFFICE

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TRACTOR MOUNTED GRAB DEVICE FOR HAY AND THE LIKE

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Application May 15, 1950, Serial No. 162,128

1 Claim. (Cl. 214—140)

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This invention relates to grab devices for clutching masses of hay, cut brush and the like unwieldly material so as to lift said masses and to retain integrity thereof while the latter are transported and deposited at a remote location.

An object of the invention is to provide an improved grab mechanism, for attachment to the conventional power lift arms of a tractor, which imposes no excessive structural strains on the load bearing parts thereof as is the case in conventional types of grab and lift devices of this character.

Another object of the invention is to provide mechanism of the type referred to in which the operator has materially improved control over confinement of the load during lifting and transportation of the latter and also over final release and deposition thereof.

A further object of the invention is to provide mechanism of the class described which, without sacrificing an appreciable amount of load carrying capacity as compared with conventional lift devices, is sufficiently compact as to permit working of the mechanism in close quarters such as animal stalls or similar confined and constricted spaces.

Still another object of the invention is to provide in a device of the type set forth, automatic trip mechanism which functions to prevent acceptance by the grab structure of a load of excessive weight which might possibly damagingly strain the operative parts of the grab or lift mechanism.

A still further object of the invention is to provide apparatus of the class described including improved load grab mechanism which is capable of dumping the load at various heights of lift at the selection of the operator in such a manner that the load will be thrust outwardly from and substantially clear of the grab so that appreciable portions of the load will not remain entangled with operative parts of the grab as is the case in conventional lift devices of this character.

It is another object of the invention to provide mechanism of the type referred to which, while providing lifting capacity commensurate with that of conventional devices of this general character, is much lighter structurally than the latter devices so as to materially reduce power demands on the tractor to effect lifting of the mechanism.

It is a further object of the invention to provide improved apparatus of the class described in which ready detachment and replacement of parts may be effected in the event that such parts should suffer accidental damage.

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It is an additional object of the invention to provide, in apparatus of the character set forth, improved load grab mechanism including opposed and cooperative grip elements arranged to substantially completely embrace the unit load object or mass of loose material to be lifted and to shift during the lifting operation so as to tightly clamp and compress the load.

The invention possesses other objects and features of advantage, some of which, with the foregoing, will be set forth in the following description of the preferred form of the invention which is illustrated in the drawings accompanying and forming part of the specification. It is to be understood, however, that variations in the showing made by the said drawings and description may be adopted within the scope of the invention as set forth in the claim.

Referring to the drawings:

Figure 1 is a perspective view of the front end portion of a tractor showing the improved grab and lift device of my invention mounted in the power lift arms thereof and conditioned to be engaged with a load object or mass of material to be lifted.

Figure 2 is a perspective view of portion of one of the power lift arms of the tractor showing the relation therewith of the upper grip member operating lever.

Figure 3 is an enlarged scale vertical sectional view taken in the plane indicated by the line 3—3 of Figure 1 and showing the latch for holding the load carrier fork in normal or load-bearing position.

Figure 4 is a view similar to Figure 3 showing the latch released.

Figure 5 is a perspective view of the latch shaft, portions of the view being broken away so as to conserve space in the drawing.

Figure 6 is a side elevational view of a portion of the tractor and the grab and lift mechanism of my invention showing the latter in lowered condition ready to be engaged with a load object or mass of material to be lifted.

Figure 7 is a view similar to Figure 6 showing the upper grip member lowered to embrace and grip a load which may be present on the load carrier fork.

Figure 8 is a view similar to Figure 6 showing the grab and lift mechanism elevated toward its upper limit of travel.

Figure 9 is a view similar to Figure 8 showing the positions of the upper grip member and the load carrier fork when dumping the load borne by the latter.

In carrying out my invention, I utilize a tractor 9 which may be of the wheel or chain tread types or which may be an automobile or light truck if desired, which is provided as part of its usual equipment with elongated carrier and control arms adapted for engagement with attachment tools such as scoop shovels, earth levelling blades and the like which are carried and operated forwardly of the tractor vehicle. As here shown, the particular tractor 9 illustrated utilizes vertically-disposed support posts 11, arranged on and suitably fixed to opposite sides of the tractor frame, on upper portions of each of which are attached by pivot brackets 12 and 13 upwardly swingable and forwardly extending main lift arms 14 and upwardly spaced and substantially parallel lift control arms 16. The outer end of each main lift arm 14 is fitted with an edgewise vertical extension bar 17 having an aperture at its extreme end for the reception of a pivot bolt 18 while the outer end of each lift control arm 16 is fitted with a clevis 19 or similar element adapted to receive a pivot bolt 21. The pivot bolts 18 and 21 provide, as is well known in the art, means for connection with the arms of the aforementioned scoop shovels or scraper blades, hydraulic cylinders 22 being interposed between pivot brackets 23 carried by each arm 14 and pivot pins 24 carried by lower portions of the support posts 11 whereby the latter arms 14 may be raised or lowered as desired, the particular arrangement of the arms 14 and 16 being such that substantial horizontal and vertical relationship respectively of devices such as the scoop shovel and scraper blade will be maintained with the ground regardless of the degree of elevation of these devices relative to the ground surface.

The improved structure of my invention, cooperative with the aforementioned standard power lift apparatus of the tractor, includes a latch frame comprising relatively spaced end links 26 pivoted at their lower ends on the pivot bolts 18, similarly attached adjacent their upper ends with the pivot bolts 21 and fixedly interconnected at their upper extremities with a cylindrical tie rod 27 extending horizontally across the front of the tractor 9. The end links 26 it will be seen interconnect the outer ends of the arms 14 and 16 so that both will move in synchronism through changing degrees of relative angularity when the main lift arms 14 are raised and lowered by the hydraulic actuating cylinders 22. Carried by the extreme outer ends of the main lift arms 14 and arranged for pivotal movement in a vertical direction and extending therebetween across the front end of the tractor 9, is a load carrier fork unit best shown in Figure 1. As here shown, the said load carrier fork comprises a plurality of preferably tool steel bars each of which is formed to provide an elongated tooth portion 28 gradually tapered toward its outer end and having at the opposite end thereof an upwardly extending arcuately curved integral back portion 29. The carrier fork bars, as shown, are spaced apart substantially equidistantly and are interconnected at points intermediate tooth portions 28 and the back portions 29 thereof by relatively aligned connector and spacer bars 31 each of which is provided at its opposite ends with angularly bent tongues 32 suitably drilled to receive bolts 33 which also pass through the teeth 28 and through the tongues 32 of adjacent spacer bars 31 to tie the teeth 28 together and to relatively align the spacer bars transversely of the carrier fork unit. Arranged to extend across the upper ends of the curved back portions 29 of the carrier fork teeth 28 is an angle iron head bar the vertical flange 34 of which is secured by bolts 36 to the said back portions and the relatively horizontal flange 37 of which extends substantially rearwardly of the carrier fork unit. Individual relatively spaced carrier teeth of the unit are provided, preferably at points rearwardly of the spacer bars 31, with upwardly extending lugs 38 or their equivalent pivotally engaging the bolts 18 at the extreme outer ends of the main lift arms 14. It will thus be seen that the load carrier fork unit is capable of tilting movement about the pivot bolts 18 from a normal operative or load engaging position, wherein the teeth 28 lie in substantial parallelism with the surface of the ground and the flange 37 of the header bar lies at right angles to and slightly below the axis of the tie rod 27, to a load releasing position wherein, when the lift arms 14 are raised, the teeth 28 may swing downwardly to assume substantially longitudinally vertical positions and the header bar including the flange 37 thereof may move upwardly and outwardly past the tie rod 27.

Means is provided for latching the load carrier fork unit in its operative or load carrying position relative to the main lift arms 14, which latching means is releasable by the operator, when the latter desires to discharge the load carried by the fork unit, and is also automatically releasable as a safety measure to protect the fork unit and its lifting mechanism against possible strain or damage in the event that lifting of a load mass of excessive weight should be attempted or if one or more of the teeth 28 should snag onto an immovable object rooted or otherwise anchored in the ground. As is best shown in Figure 5, a sleeve 39 is arranged concentrically with and journaled on the tie rod 27, oppositely coiled torsion springs 41 being arranged at and around opposite ends of the former, each spring having an end thereof anchored in an aperture 42 or secured in any other suitable manner to the sleeve, the other ends of the springs being engaged with and fixed to the upper end portions of the links 26. It will be thus seen that the springs yieldably hold the sleeve 39 against rotation in both directions on the tie rod 27. Welded or otherwise connected with the sleeve 39 adjacent opposite ends thereof is a pair of similarly positioned radially extending lugs 43 having, as shown best in Figures 3 and 4, a flat latch face 44 and a curvate end surface 46 intersecting the outer edge of the latch face and fairing into the peripheral surface of the sleeve. A lever 47 secured to and extending radially from the sleeve 39 has an eye 48 at its outer end to which is attached an end of a pull rope 49 extending rearwardly of the tractor to a position in convenient reach of the operator. The arrangement of the parts is such that the radially outer end portions of the lug latch faces 44 overlie the edge of the flange 37 of the angle iron header bar so that when the lift fork unit is in its operative or load engaging position shown in either of Figures 1, 6 or 7, the header bar will be held against upward swinging movement to preclude downward rocking of the fork unit toward load discharge position. However at the option of the operator, when the load borne by the lift fork has been elevated by the latter and positioned over the desired deposit location, the pull rope

49 may be manually jerked tight so as to swing the lugs 43 rearwardly away from overlying engagement with the header bar flange 37 thus permitting forward tipping of the load carrier fork and discharge of the material carried thereby. Such position of the load carrier fork unit is shown in Figure 9. It will be noted that in moving from load carrying position shown in Figure 8 to load dumping position shown in Figure 9, the angle iron header bar of the fork unit swings outwardly along with and after the rearmost portions of the load mass and serves to actually thrust the load outwardly away from the carrier fork so that the chances of sizeable fragments of the mass clinging to the fork will be minimized. After the load has been discharged the carrier fork swings upwardly until the header bar snaps downwardly past and under the lugs 43 thus repositioning the carrier fork for ready engagement with another load mass when the lift arms 14 are lowered. Such return of the load carrier fork to normal load engaging and carrying position is here shown as being effected by preferably a pair of torsion springs 51 interposed between the carrier fork unit and the arm extensions 17. The springs 51 have sufficient force to rapidly return to carrier fork to reset position but the said force is not sufficient to perceptibly adversely affect the load dumping movement of the fork unit. It will also be seen in Figure 3 that since the latch lugs 43 are capable of rocking movement in a forward direction, opposite to their normal load dumping movement when the control rope 49 is pulled, and are yieldably resisted in both directions of movement by the torsion springs 41, any severe downward pressure which may be imposed on the carrier fork teeth 28 such as by attempting to pick up a load of excessive weight or if any undue resistance to upward movement of the carrier fork should be offered such as by one or more of the teeth snagging under a partially buried tree or brush root or the like, will allow the lugs 43 to yieldably swing upwardly, depending upon the pressure of the spring 41 resisting such movement, until the angle iron header bar snaps free of the lugs and allows the carrier fork to swing downwardly toward dumping position thereby prematurely releasing the excessive load or freeing the teeth 28 from engagement with the aforementioned obstruction. It will be further seen that due to the arrangement of the arms 14 and 16 and their connection and relation with the end links 26, the carrier fork unit will assume a starting or load-receiving position, as shown in Figure 6 wherein the fork teeth 28 will lie substantially on and parallel to the surface of the ground and will move into an elevated position as shown in Figure 8 wherein the fork teeth will be disposed in a position of rearward inclination. Thus the fork unit in its starting position of Figure 6 may be driven by the tractor under the load object or mass of loose material to be transported and after elevation of the fork unit and its load the latter, particularly loose material such as hay, cut brush, stalks and the like, will have a tendency to be gravitationally urged rearwardly along the inclined teeth of Figure 8 rather than having a tendency to fall off the sides of the load near the margins of the lift fork unit.

I further provide, for cooperative action with the lift fork unit, a grab unit designed to securely embrace the load or mass of material which may be picked up and carried by the fork unit so as to prevent, particularly in the cases where the load comprises bulky masses of hay, brush and the like, undesirable spillage of portions of the load from the outermost marginal sections thereof. The structural details of the aforesaid grab unit are best illustrated in Figure 1 wherein it will be seen that a pair of suitable support brackets are provided suitably secured to and rising from the opposite lift arms 14 at points thereon just rearwardly of the fork unit. As here shown, each bracket comprises a length of bar metal bent in the form of an inverted U, one leg portion 52 of which is secured by a bolt 53 or other means to the extension arm 17 while the other leg portion 54 thereof is connected by a U-bolt 56 or the like to a rearward cylindrical portion of the lift arm 14. The bend portion 57 of each bracket is suitably drilled to receive an end of a pivot shaft 58 extending across the front of the tractor 9 in spaced parallel relation with the latch sleeve 39. Pivoted on end portions of the shaft 58, and extending radially outwardly therefrom, is a pair of metallic bar arms 59 having at their distal ends preferably integral downwardly curved claws 61 tapering in cross-sectional size to comparatively slender points at extreme outer ends. Laterally extending downwardly hooked claw members 62 are secured by bolts 63 or the like to the outer sides of the arms 59 and a cross member 64 or the functional equivalent thereof is interposed laterally between and secured to the arms 59 by bolts 66 or similar attachment means to tie the arms together so that the latter will swing in substantial synchronism. The arrangement of parts is such that, as will be seen in Figure 7, when the load carrier fork is in lowered or load-engaging position, the arms 59 will extend above and in substantial parallel relation therewith while the claw portions 61 of the arms will descend to terminate substantially in registry with the outer ends of the fork unit teeth 28. The arrangement is such that, within the proportions of the parts, a cross-sectional area of maximum size will be enclosed and marginally defined by the fork unit and the overlying arms 59 and their end claws 61. Means is provided controllable by the machine operator for selectively raising or lowering the grab unit. Secured, preferably by bolts 67, to and rising vertically from one of the arms 59 is a lever member 68 carrying a pivot pin 69 at its outer end which is pivotally engaged in a clevis 71 or the like secured to one end of a rearwardly extending pull rod 72 whose other end is provided with a series of relatively spaced apertures 73 a selected one of which may be engaged by a pivot bolt 74 engaged with a medial portion of an operating lever 76 conveniently pivoted at its lower end on the bracket 23 and provided at its extreme upper end with a suitable manual grip element or handle 77. A chain 78 or the like flexible member is connected at one end with a suitable anchor element 79 preferably carried by the lift arm 14 and is attached at the other end in one of the apertures 73 so as to limit the degree of downward movement of the grab unit relative to the carrier fork unit. The operating lever 76 may be pulled downwardly, from its upper or released position shown in Figure 7, and engaged with suitable catch means, here shown in Figure 2 as comprising a downwardly directed hook element 81 carried by and extending from the side of a bracket 82 or the like which may be conveniently carried by the support post 11. Since the operating lever 76 is laterally flexible, the operator may readily flex it

to effect engagement or disengagement thereof with the hook element 81. As long as the operating lever remains in engagement with the hook element 81 the grab unit may be held in elevated position, as shown in Figure 6, relative to the load carrier fork unit.

With the mechanism disposed in load-engaging condition as shown in Figure 6, the load carrier fork unit may be forcibly driven by the tractor under an object or mass of material to be lifted after which the grab unit is released to descend by its own weight so as to cause the claws 61 and 62 to engage and enclose the object or a sizeable quantity of the said material mass. With the material to be lifted thus securely in possession of the load carrier fork and grab units, the cylinders 22 are actuated to swing the lift arms 14 upwardly so as to elevate the load sufficiently to permit transportation and deposition thereof at a remote delivery location. In conventional similar mechanisms commonly classed as hay bucks, the load engaging members, functionally equivalent to the present load carrier fork unit, are of heavy and bulky wooden construction usually tipped at their extreme ends with strap iron reinforcement caps to protect the said members against splitting or breakage during load engaging operations. Due to the excessive tare weight of the load engaging unit the weight of the pay load which may be borne thereby is considerably limited and if exceeded in a comparatively small degree may split or break some of the wooden members or place such a strain thereon as to permanently damage them. Another fault lies in the fact that the aforementioned metal tips may curl away from the wood with the result that when an attempt is made to remove a border quantity of material, such as hay, stalks or the like, from a stack or considerably larger mass thereof, the operation of inserting the load carrier members under the stack and backing away so as to separate the border quantity before lifting the same, considerable amounts of material may be drawn from the stack in the wake of the receding load carrier and strewn on the ground necessitating subsequent gathering and redeposit on the main stack. A further deficiency of the aforesaid conventional hay bucks is their inability to be worked in close quarters and to deliver loads close up to vertical structures such as barn walls, fences and the like. The improved load handling mechanism of my invention due to its lightweight and sturdy construction is capable of handling a maximum pay load mass without straining or damage and by virtue of the fact that the engaged load mass is completely embraced by the grab unit very little objectional spillage will take place during lifting and subsequent transportation of the load. Furthermore, the compact design of the mechanism renders it readily maneuverable in limited spaces such as internally of bars or other structures in the operations of removing spent bedding straw from the barn floor or animal stalls and in the delivery and distribution of fresh bedding material to such locations. As additional features of advantage, the spacer bars 31 of the fork unit permit efficient use of the latter as a push rake in gathering fine debris not ordinarily engageable by the fork unit teeth and the bolted together construction renders part replacement in the latter a comparatively easy task which may be accomplished in a comparatively short time so that the loss of service time of the mechanism will be minimized.

I claim:

In mechanism including a pair of substantially vertical spaced support posts and vertically movable power lift arms pivotally attached to the respective posts for moving a load mass, a load bearing unit engageable under said load mass comprising a plurality of relatively parallel interconnected bar members having substantially straight frontally extending tooth elements and upwardly curved rearwardly extending back elements, said load bearing unit being pivotally engaged between the tooth and back elements thereof with distal end portions of said power lift arms for movement between load bearing and load releasing positions, a header bar carried by upper ends of said back elements and extending transversely across said load bearing unit, and generally normal to the longitudinal axes of said power lift arms an oscillable latch shaft carried by said power lift arms and substantially paralleling said header bar, latch lugs carried by said latch shaft and engageable with said header bar for releasably retaining said load bearing unit in load bearing position, said latch lugs being operable in both rotational directions of said latch shaft to release said header bar and permit movement of the latter from load bearing to load releasing positions, oppositely acting spring means operatively interposed between said latch shaft and said power lift arms for resisting rotational movement of said latch shaft in both directions, relatively spaced grab arms pivotally carried by said power lift arms intermediate said posts and said distal end portions of said power lift arms with the axis of rotation of said grab arms being disposed vertically above and generally parallel to the axis of said load bearing unit, said grab arms having claw portions extending over said load bearing unit, said grab arms having forwardly and laterally extending claw portions engageable with dispersed portions of said load mass for retaining the latter on said load bearing unit, a pair of lift control arms pivotally attached to said posts above said pivotal attachment of said power lift arms, links pivotally engaged at one end thereof with said distal end portions of said power lift arms, and means adjacent the other ends of said links pivotally secured to distal end portions of said lift control arms, the pivotal axis of said grab arms being disposed in such a manner whereby during raising movement of said power lift arms, said claw portions will move rearwardly relative to said load bearing unit.

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