

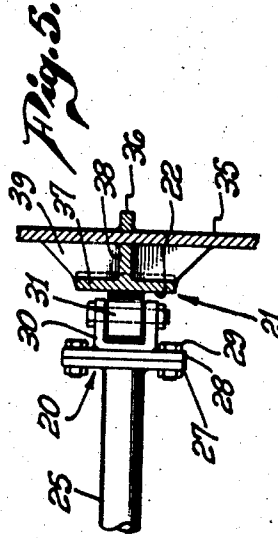
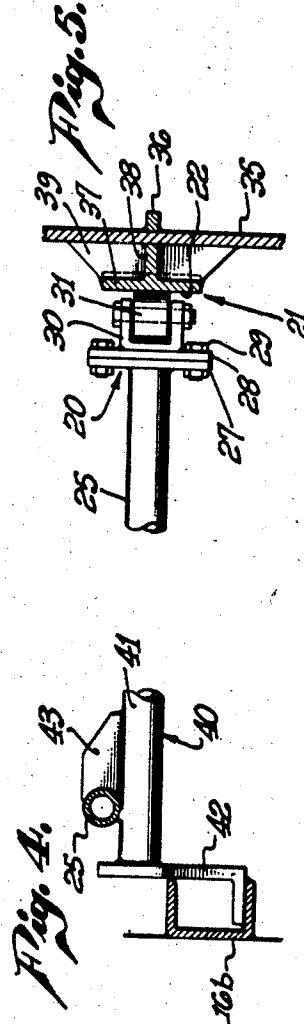
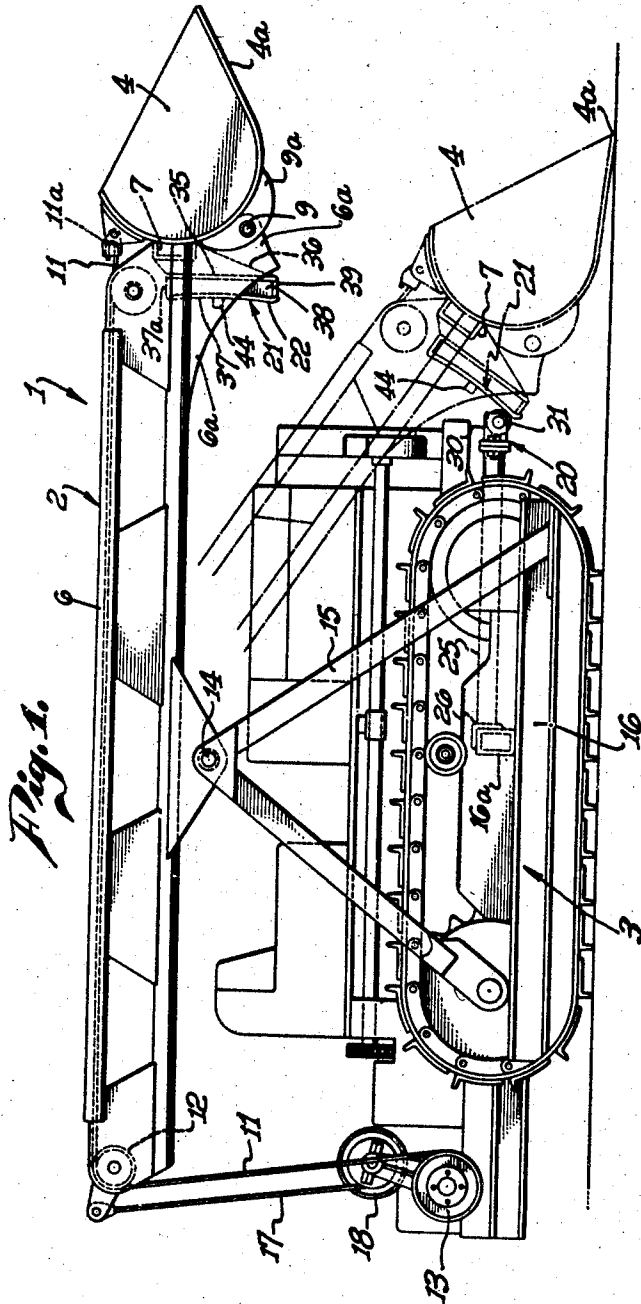
March 18, 1947.

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MATERIAL HANDLING APPARATUS

2,417,544

Filed Oct. 16, 1944

2 Sheets-Sheet 1



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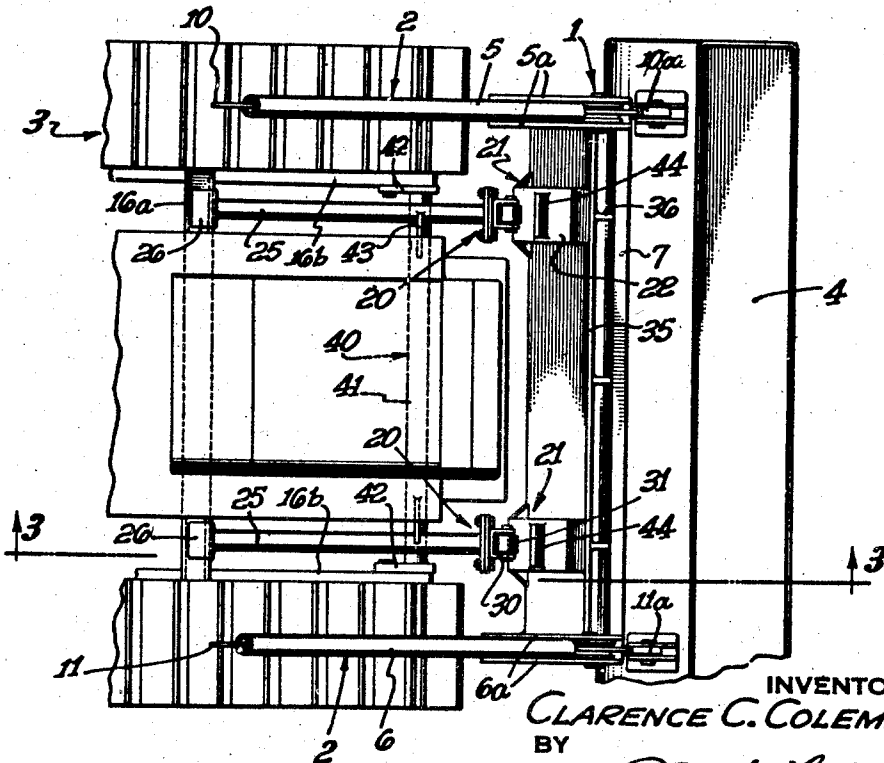
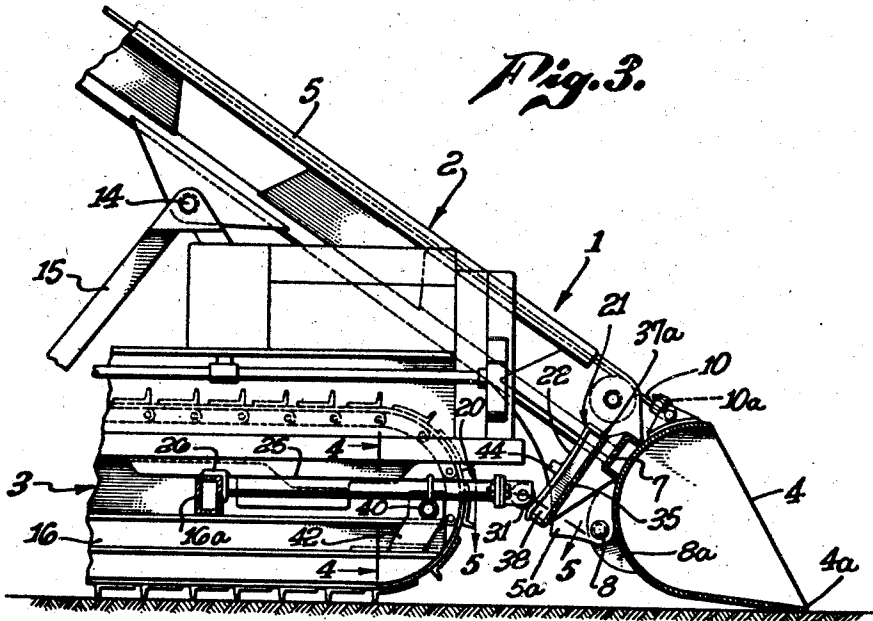
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2,417,544

MATERIAL HANDLING APPARATUS

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Application October 16, 1944, Serial No. 558,887

9 Claims. (Cl. 214-140)

1

This invention relates to material handling equipment, and more particularly to means for preventing undue stress in such apparatus.

In Patent Number 2,260,539, issued to William Ruddock on October 28, 1941, for a Tractor shovel, an apparatus is disclosed, wherein a bucket or dipper is carried on a boom or arm, which extends longitudinally of the tractor and is supported for movement about an axis extending transversely of the tractor frame, by standards mounted on opposite sides of the tractor frame. When the bucket is to be loaded, the boom is swung to lower the bucket in front of the tractor, which is advanced to force the bucket into the material to be loaded. A bumper or abutment means is provided for transferring most of the strain incident to such loading operation directly between the bucket and the frame of the tractor. Thus, the standards and other parts of the apparatus are not subjected to severe stresses, neither is the tractor's equilibrium destroyed by application of a force having a large horizontal component acting at the tops of the standards.

It is an object of this invention to provide an improved form of such abutment means.

It is another object of this invention to provide such bumper or abutment means which functions equally well for any one of several positions to which the bucket may be optionally lowered for loading.

It is another object of this invention to provide such means arranged to prevent the lowering of the bucket below a predetermined position or maximum depth of digging or scraping operations.

It is still another object of this invention to provide such means which has no tendency to raise the bucket to lift it from its operating position, incident to the forward movement of the tractor.

This invention possesses many other advantages, and has other objects which may be made more easily apparent from a consideration of one embodiment of the invention. For this purpose there is shown a form in the drawings accompanying and forming part of the present specification. This form will now be described in detail, illustrating the general principles of the invention; but it is to be understood that this detailed description is not to be taken in a limiting sense, since the scope of the invention is best defined by the appended claims.

In the drawings:

Figure 1 is a side elevation of a tractor having

2

material handling apparatus incorporating the invention mounted thereon;

Figure 2 is a plan view of the forward portion of the tractor and apparatus of Figure 1;

Figure 3 is a section taken on line 3-3 of Figure 2; and

Figures 4 and 5 are detail sections taken on the correspondingly numbered lines of Figure 3.

Referring to the drawings, a bucket and arm assembly is indicated by the numeral 1, and comprises a boom or arm structure 2, mounted on a self propelled vehicle 3, such as a tractor, for movement in a vertical plane extending longitudinally of the vehicle. The arm structure 2 has a bucket or material handling element 4 mounted on its forward end, so that said movement of the arm structure 2, serves to raise and lower the bucket. The bucket 4 has a width substantially the same as the overall width of the tractor 3, so that when the bucket 4 is in its lowered or loading position, the apparatus may be operated in a manner similar to a bull dozer, either as a scraper or to load the bucket.

In order to adequately support the bucket 4, the arm structure 2 includes a pair of spaced side members or arms 5 and 6, appropriately joined to form a unitary structure and connected to the bucket 4 near its opposite ends. For this purpose, a cross tie 7 extends transversely of the arm structure just behind the bucket 4 and is connected to the arm members 5 and 6 as by welding. The arms 5 and 6 are provided at their forward ends with a pair of plates 8a and 6a respectively, having depending portions to which the bucket is pivotally secured as by pins 8 and 9 engaging respectively, pairs of ears 8a and 9a on the bucket. The bucket is thus adapted to be swung downwardly with respect to the arm 2 from the full line loading and load retaining position of Figure 1 to dump the load.

In the loading position the cross tie 7 serves as a stop, against which the bucket 4 is held by a pair of operating cables 10 and 11, attached to the upper part of the bucket 4 as at 10a and 11a. These cables extend respectively along the arm members 5 and 6, to a sheave 12 at the rear end of each member, and thence downwardly about the sheaves 12 to winding drums 13. Appropriate actuating mechanism is provided for the drums 13, whereby they may be operated to control the bucket 4 to move the bucket to load dumping position or to loading position, and to raise and lower the bucket and arm assembly 1.

The arm structure 2 is supported by a hori-

3

zontal shaft 14 by which the arm members 5 and 6 are swingably mounted, the shaft 14 in turn being supported by standards 15 mounted on the frame 16 of the tractor 3. An additional cable 17 is connected to the rear of the arm 2 and is wound on a brake controlled spring driven reel 18, for facilitating control of the bucket and arm assembly.

The bucket 4 is intended to be loaded by being lowered to substantially the position shown in Figure 3 and supported in such position by restricting rotation of the drums 13 so that the advancing edge 4-a of the bucket will engage the material to be handled at a desired depth, and then advanced into the material by moving the tractor 3 forward. The force required to crowd the bucket into the material may be quite large with some classes of material, and severe impact loads may develop due to the bucket encountering large boulders, stumps and the like.

To prevent this force and impact loads building up severe stresses and strains in the arm structure 2 and tractor frame 16, means are provided for transmitting such force directly between the bucket 4 and the tractor frame 16. Thus, a pair of abutment members or bumpers 20 is provided, one on each side of the frame 16, and are adapted to be engaged by means 21 on the forward end of the arm structure 2 when the arm is in bucket loading position. This means 21 is mounted on the cross tie 7 which serves as a stop for the bucket 4. Thus, force is transferred substantially directly between the frame 16 and the bucket 4 through the bumpers 20. To permit operation of the bucket 4 at various positions within a limited range for loading or digging at different depths, the means 21 provides an arcuate surface or track 22 curved about the axis of the shaft 14. The transfer of force thus occurs equally well for any chosen position within this range.

Since both bumpers 20 and their cooperating means 21 are identical, only one need be described. Referring to Figures 2 and 3, it will be seen that the bumper 20 comprises a horizontal member or bar 25, which may be conveniently of standard pipe, provided with a base or foot 26 at its rear end secured to a cross member 16-a of the frame 16, as by welding. The forward end of the member 25 is provided with a flange 27 to which is attached, as by bolts 29, a similar flange 28, carrying a clevis 30 rotatably supporting a roller 31 having an axis parallel to the axis of the shaft 14 (see Figure 5). This roller 31 engages the arcuate surface or track 22 of the cooperating means 21.

A base plate 35 extends between the arm members 5 and 6 and is suitably attached to the inner plate of each pair of plates 5-a and 6-a of these arm members, and is also secured to the cross tie 7 by a plurality of bracket plates 36. The arcuate track 22 is provided by a suitably curved plate 37 mounted on the base plate 35. The plate 37 is supported above the plate 35 as by a web plate 38 and by having its upper end portion 37-a bent over to engage the plate 35. The other end of the plate 37 is braced transversely by a plate 39.

Plate 37 is so positioned with respect to the shaft 14 and abutment roller 31 that as the arm 2 is swung downwardly, the track 22 engages the roller 31 somewhat before the bucket 4 reaches the highest position at which it is arranged to be loaded. The arcuate character of the track

4

22 causes it to remain in contact with the roller for any lower position of the bucket.

In order to support the bars 25 adequately, a cross piece 40 is installed at the forward end of the frame (see Figures 2, 3 and 4). This may conveniently comprise a tubular element 41 provided with brackets 42 at its ends, which brackets are appropriately secured to the longitudinal members 16-b of the frame 16. The abutment bars 25 rest on top of the cross piece 40, being secured in place by welding and additionally by plates 43. Thus, the cross piece 40 not only serves to support the abutments 20 vertically, but also maintains them in place horizontally.

It will be apparent from an inspection of Figure 3, that the force exerted by the tractor 3 urging the bucket 4 forward, is transmitted directly from the tractor frame 16 to the bucket through the abutments 20, plates 37, base plate 35, brackets 36 and the cross tie 7. In this way, the standards 15 and the arm 2 are relieved of all stresses incident to such force, and there is no tendency to raise the forward end of the tractor, such as would exist if this force was allowed to act through the arm 2.

Another advantage of the instant arrangement is that the track 22 inclines downwardly and rearwardly under the roller 31, whereby any tendency of the bucket to rise due to the forward movement of the tractor is obviated.

In order to limit the downward movement of the bucket to a predetermined position, a block 44 may be secured on each surface 22. This block 44, by contacting roller 31, stops downward movement of the bucket and arm assembly.

I claim:

1. In material handling equipment adapted for mounting on a self propelled vehicle having a frame, and including a bucket and arm assembly supported on and above the vehicle frame for movement about a horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the material to be handled, means forming an abutment on the vehicle frame, and means forming an arcuate surface on said assembly curved about said axis, and engageable with said abutment when the bucket is in any one of several loading positions for transmitting force incident to the loading of the bucket directly to the vehicle frame.

2. In material handling equipment adapted for mounting on a self propelled vehicle having a frame, and including a bucket and arm assembly supported on and above the vehicle frame for movement about a horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the material to be handled, means forming an abutment on the vehicle frame, and means on said assembly engageable with said abutment for any position of said bucket within predetermined limits, said means including a stop engageable with said abutment when one of said limits is reached to prevent further movement of said assembly.

3. In material handling equipment adapted for mounting on a self propelled vehicle having a frame, and including a bucket and arm assembly supported on and above the vehicle frame for movement about a horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the mate-

5

rial to be handled, means forming an abutment on the vehicle frame, means forming an arcuate surface on said assembly curved about said axis, and engageable with said abutment when the bucket is in any one of several loading positions for transmitting force incident to the loading of the bucket directly to the vehicle frame, and stop means engageable with said abutment when one of said limits is reached to prevent further movement of said assembly.

4. In material handling equipment adapted for mounting on a self propelled vehicle having a frame, and including a bucket and arm assembly supported on and above the vehicle frame for movement about a horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the material to be handled, means forming an abutment on the vehicle frame, a roller carried by said abutment for free rotation about an axis substantially parallel with said horizontal axis, and means forming an arcuate surface on said assembly curved about said horizontal axis and engageable with said roller when the bucket is in loading position, for transmitting force incident to the loading of the bucket directly to the vehicle frame.

5. In material handling equipment adapted for mounting on a self propelled vehicle having a frame, and including a bucket and arm assembly, said bucket extending transversely of the vehicle substantially the entire width thereof, said arm comprising a pair of members attached to the bucket at widely spaced points across the width thereof and being supported on and above the vehicle frame for movement about a common horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the material to be handled, means forming a cross tie joining said members adjacent the bucket, means forming a pair of abutments on opposite sides of the vehicle frame, and means adapted to transmit force between said bucket and said abutments through said cross tie means, when the bucket is in loading position.

6. In material handling equipment adapted for mounting on a self propelled vehicle having a frame, and including a bucket and arm assembly supported on and above the vehicle frame for movement about a horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the material to be handled, means forming an abutment on the vehicle frame, and means forming a surface on said assembly engageable with said abutment when the bucket is in loading position, said surface when engaged with said abutment inclining downwardly and toward said abutment, a portion of said surface passing beneath said abutment, whereby said abutment during the loading of the bucket restrains upward movement of said assembly.

7. In material handling equipment adapted for mounting on a self propelled vehicle having a

6

frame, and including a bucket and arm assembly supported on and above the vehicle frame for movement about a horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the material to be handled, means forming an abutment on the vehicle frame, means forming a surface on said assembly, engageable with said abutment, when the bucket is in loading position, said surface when engaged with said abutment inclining downwardly and toward said abutment, a portion of said surface passing beneath said abutment, whereby said abutment during the loading of the bucket restrains upward movement of said assembly, and means on said surface engageable with said abutment to limit downward movement of said assembly.

8. In material handling equipment adapted for mounting on a self propelled vehicle having a frame, and including a bucket and arm assembly supported on and above the vehicle frame for movement about a horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the material to be handled, means forming a forwardly directed abutment on the vehicle frame, and means on said arm continuously engageable with said abutment over a limited range of movement of the arm, when the bucket is in loading position.

9. In material handling equipment adapted for mounting on a self propelled vehicle having a frame, and including a bucket and arm assembly, said bucket extending transversely of the vehicle substantially the entire width thereof, said arm comprising a pair of members attached to the bucket at widely spaced points across the width thereof and being supported on and above the vehicle frame for movement about a common horizontal axis to raise and lower the bucket, the bucket being lowered in advance of the vehicle to be loaded by movement of the vehicle urging the bucket into the material to be handled, means forming a cross tie joining said members adjacent the bucket, and abutment means mounted on the vehicle frame, extending forwardly thereof, and effective to engage said cross tie means at a point intermediate and spaced from said members.

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