June 29, 1954 M. C. WILLS ET AL 2,682,346

DIPPER CONTROL FOR DITCHING MACHINES

Filed April 14, 1952 2 Sheets-Sheet 1

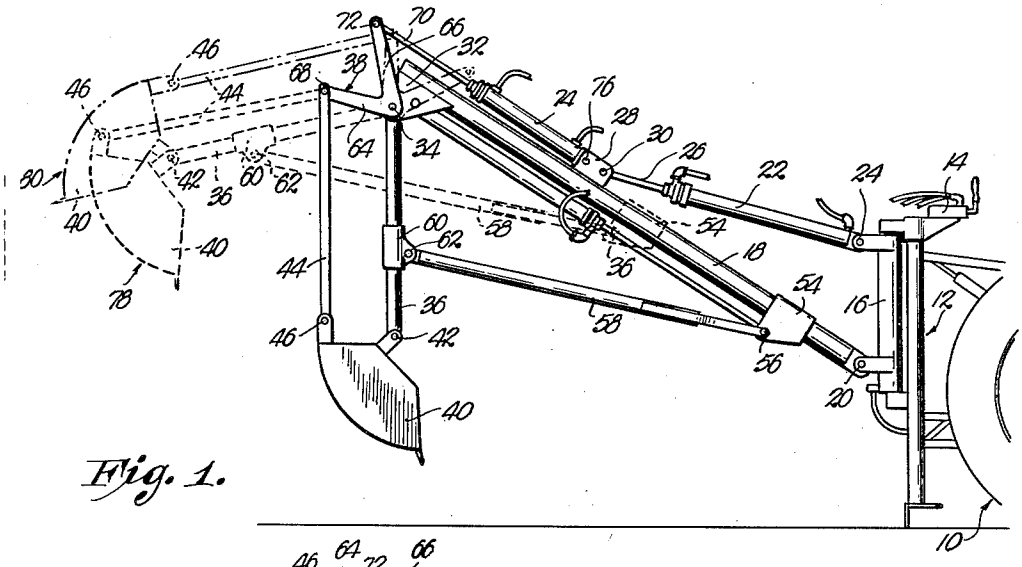


Fig. 1.

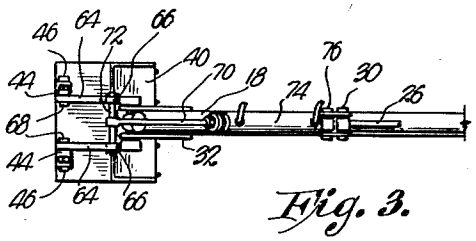


Fig. 3.

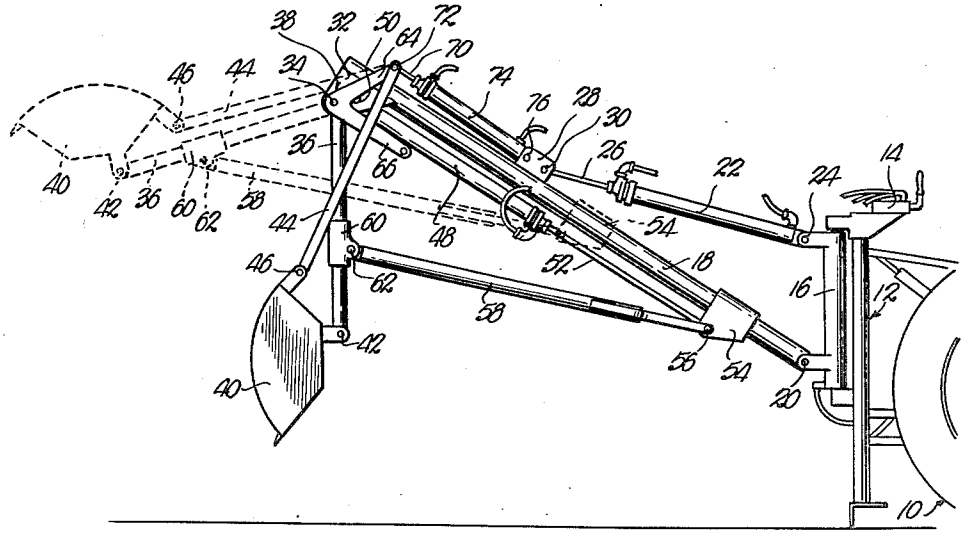


Fig. 2.

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2 Sheets-Sheet 2

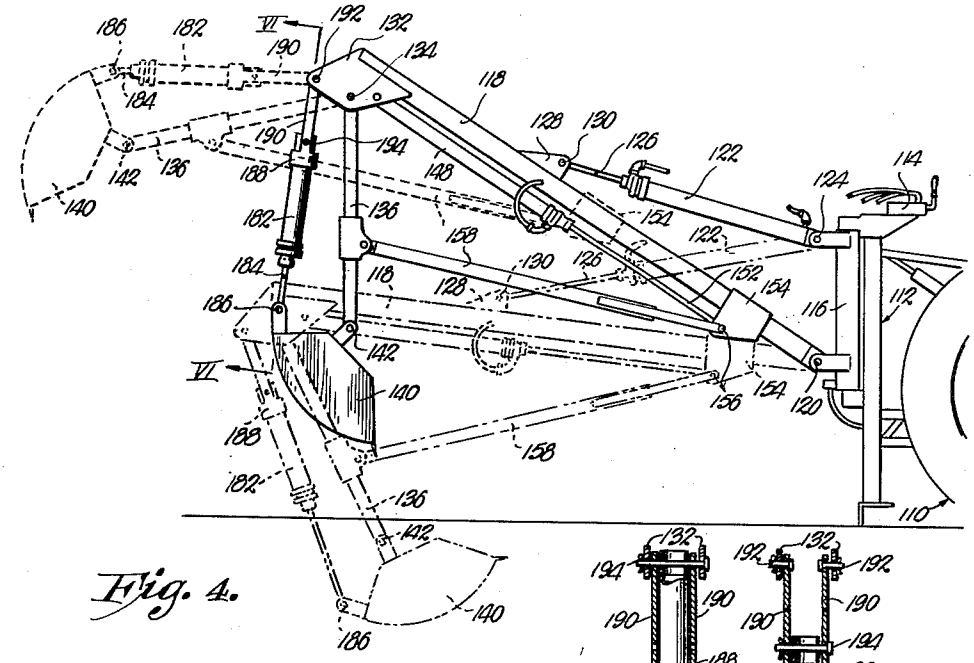


Fig. 4.

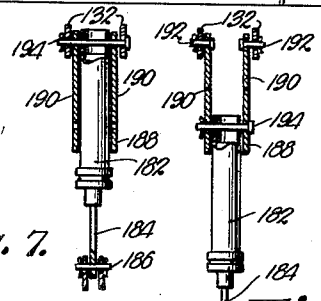


Fig. 7.

Fig. 6.

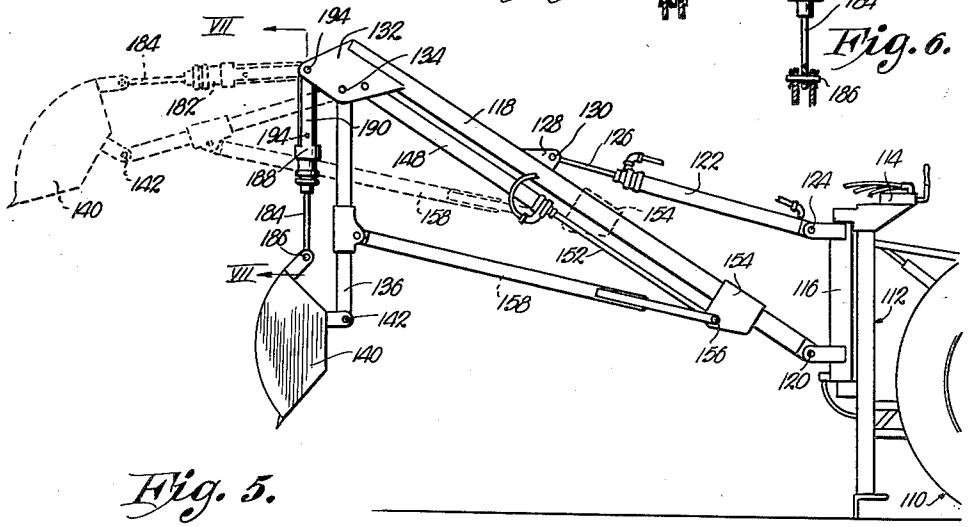


Fig. 5.

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DIPPER CONTROL FOR DITCHING MACHINES

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7 Claims. (Cl. 214—140)

1

This invention relates to earth handling equipment in the nature of a boom and bucket assembly and includes highly maneuverable control means adapting the equipment for various uses such as the digging of ditches, basements and other excavations, moving the dirt, rock, sand or other material to a desired discharge point such as into a truck box, and shaping and forming the vertical side walls of the hole being dug.

It is the most important object of this invention to provide improved bucket control means for earth handling equipment similar in some respects to the "Ditching Attachment for Tractors" forming the subject matter of our co-pending application, Serial No. 195,928, filed November 16, 1950, this being a continuation-in-part of said application.

The equipment forming the subject matter of our co-pending application included a boom swingable both on a vertical and on a horizontal axis, together with a bucket arm depending from the boom and swingable relative thereto. The bucket of our co-pending application, while swingable on the boom, was held in a predetermined position by an adjustable, but non-extensible link joined directly to the bucket arm.

It is the most important object hereof to provide means for maintaining a predetermined position or attitude of the bucket as the same is moved toward a dumping position wherein the material such as loose sand and gravel, will not flow from the bucket prior to dumping, such means being under the control of the operator and making it possible to quickly and easily adjust the bucket and thereby adapt the same for many uses.

It is an important object of the present invention to provide a dipper or bucket control in the nature of parallel motion mechanism for maintaining the bucket in a predetermined, undumped condition or position as the bucket swings to and from an elevated position ready for dumping.

Another object hereof is to provide a dipper control including structure that may be manipulated by the operator for dumping the bucket after the same has been swung or elevated to a dumping position.

Other objects include the way in which a double-acting piston within a fluid cylinder is provided on the boom for predetermining the normal position of the bucket and for dumping the same; the way in which an auxiliary control member much in the nature of a crank, is swingably mounted and disposed in interconnecting relationship between the piston rod and the bucket to accomplish the above results; the way

2

in which there is provided means adapted for connection at a number of points, thereby adapting the assembly for various uses including shaping of the side walls of an excavation; and many other more minor objects, all of which will be made clear or become apparent as the following specification progresses.

In the drawings:

Figure 1 is a side elevational view of a dipper control for ditching machines made pursuant to one form of the present invention, illustrating in dotted-lines and in dash-lines, various possible positions of the bucket or dipper and other elements of the assembly.

Fig. 2 is a side elevational view similar to Fig. 1, showing the operation of the assembly when the dipper link is coupled in a manner differing from the connection shown in Fig. 1.

Fig. 3 is a fragmentary, top plan view of the assembly when the connections are made as shown in Fig. 1.

Fig. 4 is a side elevational view similar to Fig. 1, showing a modification of the present invention.

Fig. 5 is a view similar to Fig. 4 showing an alternate manner of coupling.

Fig. 6 is an enlarged, detailed, cross-sectional view taken on line VI—VI of Fig. 4; and

Fig. 7 is an enlarged, detailed, cross-sectional view taken on line VII—VII of Fig. 5.

As in our co-pending application, the equipment hereof is particularly adapted for mounting upon a tractor at the rearmost end thereof, said tractor being shown in the embodiment of Figs. 1 and 2 of the drawings, and broadly designated by the numeral 10. A frame 12 is provided for normally resting upon the ground, but coupled with the tractor 10, i. e. with the power-lift mechanism thereof, in a manner to permit raising of the frame 12 and all parts coupled therewith above the ground during forward or rearward travel of the tractor 10, the frame 12 not only carrying manual control valves 14 for the various hydraulic actuating means hereinafter mentioned, but rotatably receiving a vertical tube 16 that permits swinging of an elongated boom 18 on a vertical axis.

A fluid cylinder and double-acting piston (not shown) are provided on frame 12 and coupled with the vertical tube 15 to rotate the same throughout at least a 180 degree arc.

The particular type of piston-cylinder constructions used herein forms no part of the present invention, but one desirable form thereof is disclosed in our copending application filed

on even date herewith and entitled "Hydraulic Cylinder."

The boom 18 is pivotally secured to the tube 16 as at 20, for swinging movement on a substantially horizontal axis, such swinging movement being accomplished by a fluid cylinder 22 pivotally joined to the tube 16 as at 24 and a double-acting piston within the cylinder 22 having a piston rod 26. A bracket 28 on the boom 18 is provided with a pivot pin 30 for coupling the piston rod 26 to the boom 18.

Boom 18 is also provided with a bracket 32 at the uppermost end thereof having a pivot pin 34 common to a bucket arm 36 and to a crank member 38. In other words, the bucket arm 36 shown in Figs. 1 and 2 as depending from the boom 18 at the uppermost end thereof, is swingable on the substantially horizontal axis of pivot pin 34. Bracket 32 is composed of a pair of opposed plates as shown in Fig. 3 and the arm 36 is disposed therebetween, whereas, the crank 38, likewise consisting of a pair of identical members as shown in Fig. 3, embraces the two plates 32.

A bucket or dipper 40 is swingably carried by the arm 36 at the normally lowermost end thereof by means of a pivot pin 42, and a link 44 pivotally interconnects the bucket 40 and the crank 38. Actually, there are two links 44 as shown in Fig. 3 of the drawing pivotally joined with the bucket 40 by means of pins 46.

Swinging movement of the arm 36 relative to the boom 18 is accomplished by means of a fluid cylinder 48 pivotally connected with the plates 32 therebetween as at 50. Cylinder 48 is provided with a double-acting piston having a piston rod 52 that is in turn joined with a slide member 54 on the boom 18 by means of a pivot pin 56. Slide member 54 reciprocates on the boom 18 along the longitudinal axis thereof between pivot pin 20 and the bracket 28 under influence of the double-acting piston within cylinder 48. The pin 56 also pivotally receives a bifurcated end of a link 58, the opposite end of link 58 being joined with a bracket 60 on the arm 36 by means of a pivot pin 62.

This novel means for swinging arm 36 forms the subject matter of our co-pending application filed on even date herewith and entitled "Ditcher Having Slidable Boom Supported Control Means."

The two cranks 38 are V-shaped presenting a pair of fingers or elements 64 and 66, the pivot pin 34 being at the point of merger between the two diverging elements 64 and 66. In Fig. 1 of the drawing, the uppermost ends of the links 44 are coupled with the elements 64 of cranks 38 by means of pivot bolts 68 and the two elements 66 of cranks 38 are joined with a piston rod 70 by a pin 72. As shown in Fig. 3 of the drawing, the piston rod 70 is disposed between the two spaced elements 66 and extends into a fluid cylinder 74 where it connects with a double-acting piston not shown.

The cylinder 74 has pivotal connection as at 76 with the bracket 28 on boom 18. In the connection shown in Fig. 2 of the drawing, the elements 66 of cranks 38 are not used. Instead, the two links 44, the two elements 64, and the piston rod 70 are all pivotally interconnected by means of pin 72. The manner of coupling the cylinders 22, 48 and 74, as well as the cylinder for motivating tube 16, with a source of fluid under pressure, as well as the nature of the manual control valve unit 14, may be conventional and need not be further described.

It is noted in Fig. 1 of the drawing, that the length of the element 64 has been chosen, when considering the distance between pivot pins 42 and 46, to dispose the arm 36 and the links 44 in substantial parallelism. This parallel condition is maintained at all times when the connections are made as shown in Fig. 1 of the drawing, but is not particularly important since the object of the connections is to assure that the bucket 40 will remain in the position shown in full lines in Fig. 1 with respect to the horizontal and vertical, even after swinging of the bucket 40 to position 78 shown in Fig. 1. It is clear that such movement of bucket 40 is accomplished by retraction of piston rod 52 into the cylinder 48, thereby moving the slide 54 upwardly toward the bracket 28 and swinging the bucket arm 36 on pivot pin 34 of boom 18.

The predetermined position or attitude of bucket 40 as shown in full lines in Fig. 1, is selected by actuating the piston within cylinder 74. Thus, when piston rod 52 is retracted, the parallelism and other relative positions of arm 36 and links 44 remain the same as long as the piston rod 70 is maintained in a predetermined position. It is seen that when rod 52 is retracted while rod 70 is held against movement relative to cylinder 74, arm 36 swings on pivot pin 42 and links 44 swing on pivot bolts 46 relative to the bucket 40, but the latter remains in the same attitude in position 78 as in the full-line position shown in Fig. 1. Thus, any dirt, sand, gravel or other material that is scooped up by the bucket 40 when the same is moved downwardly from the full-line position of Fig. 1 into engagement with the ground, will not tend to fall out of the bucket 44 as the same is swung to position 78. By actuation of the piston rod 26 and/or the piston rod for controlling the tube 16, the bucket 40 may be positioned above a truck or trailer or be swung to a point of discharge of the material from bucket 40. The operator thereupon, through use of unit 14, causes retraction of the rod 70 to swing the cranks 38 and thereby, through links 44, to swing the bucket 40 relative to the arm 36 to dumping position 80, shown in Fig. 1. Accordingly, when the bucket 40 is swung from within a hole or other excavation toward the position 80, no action on the part of the operator is necessary to change the relative positions of the bucket 40 and the arm 36, but as soon as dumping is desired, the proper valve may be opened to retract rod 70 and swing bucket 40 relative to arm 36 to dumping position 80.

Oftentimes equipment of this character is placed in use not for the purpose of moving material from one point to another, but for the purpose of shaping walls such as the vertical side walls of a ditch or the basement of a building. In such instances it is not necessary or desired to maintain a predetermined attitude in the bucket 40. Accordingly, the links 44, as well as the elements 64 of cranks 38, may be coupled directly with the rod 70 as shown in Fig. 2, in which case the elements 66 are not used. Normally, when the assembly is used in this manner, a predetermined position between the bucket 40 and the arm 36 is set by extending or retracting the rod 70. Such adjustment may be made by the operator from the seat of tractor 10 merely by manipulation of one of the valves of unit 14.

In this connection, in our co-pending application, Serial No. 195,928, the pitch of the bucket

thereof was varied by changing the point of interconnection between link or links 44 and the arm 36 to which such links were attached. The pitch necessitated, however, a disconnection and repositioning of the links 44 relative to the arm 36, whereas, in the present invention, the pitch control is automatic by means of shifting of the rod 70 relative to the cylinder 74. It is seen in Fig. 2 of the drawing that the relative positions of the links 44 and the arm 36 changes as the bucket 40 is swung from the full-line position to the dotted-line position of Fig. 2, and, in this respect, the operation differs from that of Fig. 1 where links 44 are joined with elements 64 and a predetermined, relative positioning of links 44 and arm 36 is maintained throughout swinging movement of the bucket 40, arm 36 and links 44 relative to the boom 18.

In the following description of the form of our invention shown in Figs. 4 to 7, inclusive, parts identical with those above set forth are similarly designated, but with each numeral increased a hundred-fold. It is noted first that cylinder 74, stem 70, crank member 38, and links 44 have been eliminated from the form about to be set forth, and in lieu thereof there has been provided an hydraulic cylinder 182 having a double-acting, reciprocable piston therein provided in turn with a stem 184. Stem 184 is pivotally secured to bucket 140 as at 186, whereas cylinder 182 is confined within a closed collar 188.

A pair of opposed, elongated arms 190 extend in relative parallelism from collar 188, and are pivotally secured to bracket 132 by a pair of pins 192. A cross-pin 194 through the arms 190 and the cylinder 182 secures the latter to arms 190. (See Figs. 1 and 6.) Alternately (see Figs. 2 and 7) pins 192 are removed and the pin 194 is used to pivotally join cylinder 182 and arms 190 to bracket 132.

It is clear from the foregoing that the novel manner of connecting the cylinder 182 to the bracket 132 in the modification shown in Figs. 4 to 7, inclusive, permits easy adjustment, depending upon the use to which the machine is to be placed. The piston within cylinder 182 and accordingly the stem 184 is controlled from the seat of tractor 110 through the valving means 114 and, therefore, the attitude of the bucket or dipper 140 may be pre-set or varied during use as desired.

When the cylinder 182 is coupled in the manner shown in Figs. 4 and 6 of the drawings, proper manipulation of the various valves forming a part of the unit 114 will permit swinging of the boom 118 as well as the arm 136, and the dipper 140, to dig or scoop earth in the manner shown by dash lines in Fig. 4 of the drawings. As the boom 118 is elevated and as the arm 136 is swung upwardly with respect to boom 118, the stem 184 may be adjusted to maintain the bucket 140 in a position where its contained dirt will remain in the bucket 140 until the dumping operation is to take place. After the bucket 140 is moved to a position above a truck box or the like, retraction of the stem 184, as shown by dotted lines in Fig. 4, will swing the bucket 140 to a dumping position.

It is contemplated that the coupling of cylinder 182, as shown in Figs. 5 and 7 of the drawings, will be used primarily when the operator is desirous of shaping the vertical side walls of an excavation. By proper adjustment of the stem 184 the pocket 140 can be pre-set substantially as shown in full-lines in Fig. 5 of the drawings, and reciprocated vertically through manipulation of the valve unit 114.

For the most part, therefore, the modifications herein set forth present highly maneuverable structure adapting the earth handling equipment for various uses not heretofore made possible and, while other modifications are contemplated hereby, such changes and alterations that fairly come within the spirit of the invention may obviously be made within the scope of the appended claims.

Having thus described the invention, what is claimed as new and desired to be secured by Letters Patent is:

1. In earth handling equipment, a boom; a bucket arm swingably secured to said boom; means for swinging the arm relative to the boom; a bucket swingably secured to said arm; and apparatus for swinging said bucket relative to the arm including an actuating assembly on the boom, a bucket link pivotally secured to the bucket, and a swingable member pivotally interconnecting said link and said assembly.

2. In earth handling equipment, a boom; a bucket arm and a control member each swingably secured to said boom; means connected with the arm for swinging the same relative to the boom; a bucket swingably secured to said arm; a bucket link pivotally interconnecting said bucket and said member; and an assembly mounted on the boom and pivotally connected with the member for swinging the bucket relative to the arm.

3. In earth handling equipment, a boom; a bucket arm and a control member each swingably secured to said boom; means connected with the arm for swinging the same relative to the boom; a bucket swingably secured to said arm; a bucket link pivotally connected with said bucket; an assembly mounted on the boom for swinging the bucket relative to the arm; and a plurality of selective means on the member for pivotally connecting the arm and the assembly to the member.

4. In earth handling equipment, a boom; a bucket arm swingably secured to said boom; means for swinging said arm relative to the boom; a bucket swingably secured to the arm; a pair of rigidly interconnected elements pivotally secured to the boom; a bucket link pivotally interconnecting one of the elements and the bucket; and an assembly pivotally interconnecting the boom and the other element for swinging the bucket relative to the arm.

5. In earth handling equipment, a boom; a bucket arm swingably secured to said boom; means for swinging said arm relative to the boom; a bucket swingably secured to the arm; a pair of rigidly interconnected elements pivotally secured to the boom; a bucket link pivotally interconnecting one of the elements and the bucket; and an assembly pivotally interconnecting the boom and the other element for swinging the bucket relative to the arm, said link being optionally attachable to said other element at the point of pivotal connection between the assembly and the other element for swinging movement of the link relative to the other element.

6. In earth handling equipment, a boom; a bucket arm, and a bucket swingably secured to the arm; a V-shaped member having a pair of elements; means common to the arm and the member for pivotally securing the same to the boom; a bucket link pivotally interconnecting the bucket and one of said elements; a fluid pressure cylinder pivotally secured to the boom; and a double-acting piston within the cylinder provided

with a piston rod pivotally connected with the other of said elements.

7. In earth handling equipment, a boom, a bucket arm, and a bucket swingably secured to the arm; a V-shaped member having a pair of elements; means common to the arm and the member for pivotally securing the same to the boom; a bucket link pivotally interconnecting the bucket and one of said elements; a fluid pressure cylinder pivotally secured to the boom; and a double-acting piston within the cylinder provided with a piston rod pivotally connected with the other of said elements, said link being optionally attachable to said other element at the

point of pivotal connection between the piston rod and the other element for swinging movement of the link relative to the other element.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
D. 162,873	Pilch	Apr. 10, 1951
1,430,542	French	Oct. 3, 1922
1,561,694	Clutter	Nov. 17, 1925
2,470,147	Cramer	May 17, 1949
2,496,874	Holopainen	Feb. 7, 1950