EJECTOR MECHANISM FOR EARTHMOVING SCRAPER

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Filed Oct. 17, 1966, Ser. No. 387,262

Int. Cl. E02F 3/76, 3/84

U.S. Cl. 37—126

3 Claims

ABSTRACT OF THE DISCLOSURE

The upper and lower parts of a scraper ejector are supported by links to cause the ejector to follow an arcuate path through the scraper bowl in a relatively upright manner. In the retracted position of the ejector it becomes the rear wall of the scraper bowl.

The present invention relates to earthmoving machinery and especially to scrapers, and it is particularly adaptable to scrapers of the bowl type in which a chamber or bowl having a sharp lower lip or blade is filled with earth by propelling it along the ground with the lip in contact therewith, whereupon the earth will be scraped up to accumulate in the chamber. When the chamber is full, the bowl is raised and the machine is driven to a desired discharge point; and an ejector, forming the back wall of the chamber, is moved forward to push the load out over the lip, the lip now being raised out of the ground as stated. Commonly the ejecting is done while the machine is in motion, thereby distributing the material in an even layer, as is desirable; and an object of the invention is to improve the ejector and the mechanism for operating it in a machine of this general type.

Earthmovers of this class have supporting wheels rearwardly of the bowl; and under some conditions it is desirable to incorporate an engine in the structure, between such wheels, to drive the latter and assist the engine regularly supplied at the front of the machine; and a further object is to supply a mechanism for moving the ejector which is of such proportions that it may be readily incorporated substantially entirely in the space back of the bowl and between the wheels and that will not have any parts that extend backwardly far enough to interfere with the attachment and detachment of such an engine, or the servicing thereof.

A further object is to provide such a structure which does not require special sliding guides within the bowl; which gives a substantially complementary movement of the blade along the floor of the bowl; and in which the blade is given a gradually changing inclination from slightly forward, when at the rear of the bowl, to appreciably backward, when at the front of the bowl, so as to avoid compressing the material against the apron in the effort to eject it. A further object is to supply such a mechanism which may be activated by an expansible motor or ram of reasonable proportions and in which the force of the ram is applied with varying leverage so that the force is greatest at the time of starting to eject the load and decreases as ejection takes place and the need for force decreases.

Further objects and advantages will become apparent from the following description when read in conjunction with the accompanying drawings in which:

FIG. 1 is a vertical longitudinal sectional view of so much of a bowl type scraper as necessary for an understanding of the invention;

FIG. 2 is a similar view with the parts in a different position; and

FIG. 3 is a top view of the scraper shown in FIG. 2. Referring to the drawings, the machine comprises a bowl structure 3 including upward side walls 4, 4', a floor portion 6, and a rearwardly projecting frame portion 8, the latter being carried on laterally spaced supporting wheels 10, 10'. The draft structure at the front of the machine may be of any suitable type and is not shown since it forms no part of the present invention.

A cutting edge or blade 12 is carried at the front of floor 6 on a rugged cross member 14 and serves when the bowl is lowered to cut the earth as previously indicated. A rugged structural member 16 extends across the bottom at the rear of floor 6 and connects with and forms a part of frame 8. A plate-like ejector 18 is disposed rearwardly, substantially normal to the side walls 4, 4', and forms a back wall of bowl structure 3 in the scraping and transporting positions of the parts and comprises an upstanding ejector plate 20 to which are attached at its lower portion a pair of forwardly extending rigid bracketlike arms 22, 22', spaced apart to the extent of the width of plate 20. Arms 22, 22' are arranged close to side walls 4, 4', so as to be encumbered as little as possible by the earth in bowl structure 3.

Arms 22, 22' have pivoted thereto on pins 24, 24', links 26, 26', which are also pivoted on pins 28, 28' close to the top of the side walls 4, 4' of the bowl structure 3 and which, in swinging about pins 28, 28', tend to guide the lower edge of plate 20 in a path close to floor 6. The structure so far described would, of course, be unstable; and plate 20 also has on its rear face a pair of rearwardly projecting bracketlike arms 30, 30', to which are pivoted on pins 32, 32' at a relatively high elevation on arms 30, 30', a pair of link levers 34, 34'. Link levers 34, 34', are full-ramped on pivots 36, 36', spaced backwardly from plate 20 and strongly supported on frame 8. The ejector blade structure is therefore supported for movement in a predetermined path by swinging of links 26, 26', and link levers 34, 34' and which path is complementary to the interior of bowl 3 and determined by the links without depending on contact with the bowl.

It is contemplated that blade 20 will have slight clearance relatively to sides 4, 4', and floor 6; but if contact does occur by reason of variations in manufacture or deterioration of the structure, it will be minor; and the main guiding force will be exerted by the links and pivots so as to minimize interference with the bowl structure.

Link levers 34, 34' are rigidly interconnected by torsion members 46, 47 to form a rigid link lever assembly and piston rods 40, 40' of fluid pressure motors 42, 42' are pivotally connected to levers 34, 34', 30, 30' by pins 38, 38'. The cylinders 41, 41' of motors 42, 42' are pivotally connected to frame 8 by pins 44, 44' spaced rearwardly of pivots 36, 36' so that expansion of motors 42, 42' will cause a substantial forward swinging force in link levers 34, 34' and will advance plate 20 forwardly through bowl 3 from the rear thereof as shown in FIG. 1 toward cutting edge 12 as shown in FIG. 2. The torsion members 46, 47 rigidly interconnecting link levers 34, 34' are operative to prevent any tendency of the ejector to become displaced from a position normal to the side walls 4, 4' by virtue of their inherent resistance to twisting.

It is to be noted that the effective lever arm through which motors 42 operate on link levers 34, 34' is longest in the backward or FIG. 1 position of the parts and that it gradually shortens as link levers 34, 34' swing toward the forward position as seen in FIG. 2. It follows that, for a given amount of force developed in motors 42, 42' the greatest force will be applied to blade 20 at the beginning of the ejecting movement or in the FIG. 1 position of the parts, which is the position in which the greatest resistance to the ejecting movement will be encountered. On the other hand, as the effective lever arm becomes
shorter, more movement will be imparted to blade 20 for each increment of movement of motors 42, 42' so that the latter need have a stroke equivalent to only a fraction of the total movement of plate 20.

In the disclosed embodiment the lower edge of plate 20, which travels adjacent floor 6, moves somewhat more than two and a half times the stroke of piston rods 40, 40'. Thus, it is possible to use motors or rams of reasonable proportions; and, owing to the upright position of the rams, it does not interfere with the engine 48 mounted on frame 8 which drives the rear wheels 10, 10' through means not shown.

In operation, the bowl 3 is lowered in well known manner until blade 12 is in contact with the ground, and the machine is so propelled that blade 12 scrapes up or 15 cuts earth which accumulates in bowl 3 on floor 6, plate 20 being disposed at the rear of bowl 3 as shown in FIG. 1. When the desired amount of earth has been accumulated, bowl 3 is raised and the machine driven to a desired point of discharge, whereupon motors 42, 42' are actuated and blade 20 is moved forwardly, urging the earth outwardly over blade 12 onto the ground.

It is to be noted that link levers 34, 34' approach a dead center relation with plate 20, insofar as forward motion of the plate is concerned, as the levers approach their forward position shown in FIG. 2, while links 26, 26' approach and pass through a position at right angles to the direction of the lower edge of plate 20. As a result, assuming a steady rate of advance of piston rods 40, 40' the upper portion of plate 20 will move forward with a gradually slowing movement, while the lower edge will move forward with a gradually increasing movement. The ejector 18 will, therefore, move from a nearly vertical or slightly forwardly inclined position, as shown in FIG. 1, to an appreciably rearwardly inclined position as seen in FIG. 2. The ejector plate will thus avoid any tendency to compress the material against apron 49 during ejection, but rather will tend to get under it and ease it out of the bowl over edge 12.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows. I claim:

1. In an earthmover of the type having a bowl structure with a bottom wall rigidly interconnecting transversely spaced side walls and having a cutting edge at its forward end, the combination comprising:
   a vertically disposed ejector extending transversely between said side walls having a pair of forwardly ex-
   tending arms rigidly fixed to lower transversely opposite ends thereof and a rearwardly extending arm rigidly fixed to the upper portion thereof, and means supporting said ejector for movement between a rearwardly retracted position in which said ejector serves as a rear wall of said bowl structure and a forward ejection position including a pair of links pivotally connected to upper portions, respectively, of said side walls forwardly of said ejector and pivotally connected to said forwardly extending arms, respectively, and an upwardly directed link lever assembly pivotally supported at its lower end on said bowl structure rearwardly of said ejector and pivotally connected at its upper end to said rearwardly extending arm.

2. An earthmover having all the characteristics of claim 1 including an expandable motor pivotally supported on said bowl structure rearwardly of said link lever assembly and pivotally connected to said link lever assembly upwardly of its pivotal connection to said bowl structure.

3. An earthmover having all the characteristics of claim 1, in which said ejector is substantially normal to said side walls and said assembly includes a pair of laterally spaced upwardly directed link levers pivotally supported at laterally spaced points on said bowl structure rearwardly of said ejector and pivotally connected to said rearwardly extending arm, and a torsion resisting member rigidly connected to both of said link levers, whereby any tendency in said ejector to become displaced from a position normal to said side walls will be prevented by the resistance to twisting inherent in said torsion resisting member.

4. An earthmover having all the characteristics of claim 1 wherein said pair of links are disposed forwardly of said ejector in all positions of the latter.

5. An earthmover having all the characteristics of claim 1 wherein said ejector follows an arcuate path in its movement between its retracted and ejection positions.

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