United States Patent

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[54] **SCRAPER**

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[52] **U.S. Cl.**.....**37/127,** 214/500

[51] **Int. Cl.**.....**E02f 5/00,** E02f 3/62

[58] **Field of Search**.....37/124, 126 R, 126 A, 126 AA, 37/126 AB, 126 AC, 126 AD, 126 AE, 127, 128, 129, 129 G, 129 H, 133; 214/500

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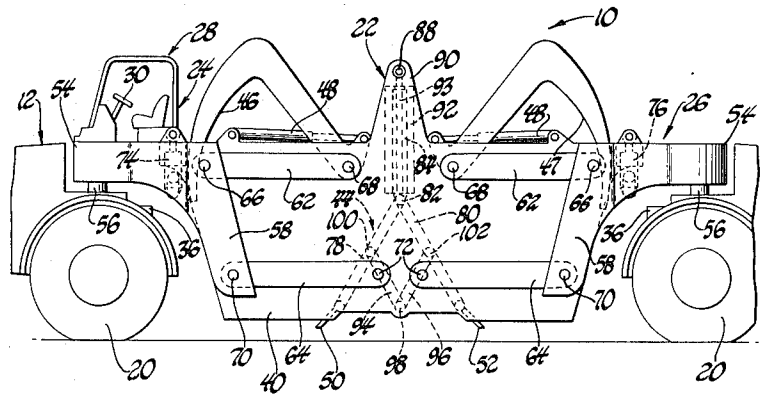
[57] **ABSTRACT**

An earthmoving scraper having a front drive unit and a rear drive unit and a scraper bowl located therebetween. Both the front and rear drive units are steerable about vertical axes and the scraper bowl is open at opposite ends so that the scraper can be driven in either direction for loading the bowl. An ejector system is provided which serves to discharge material out of the bowl by gravity.

3 Claims, 4 Drawing Figures



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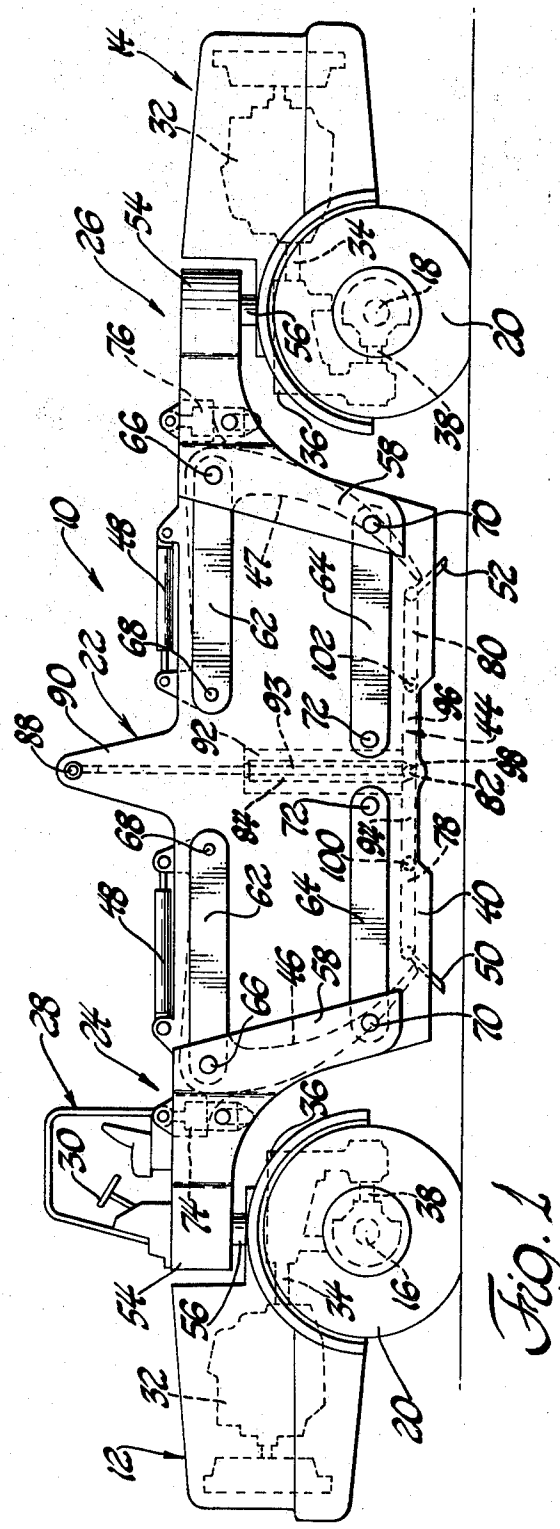

FIG. 1

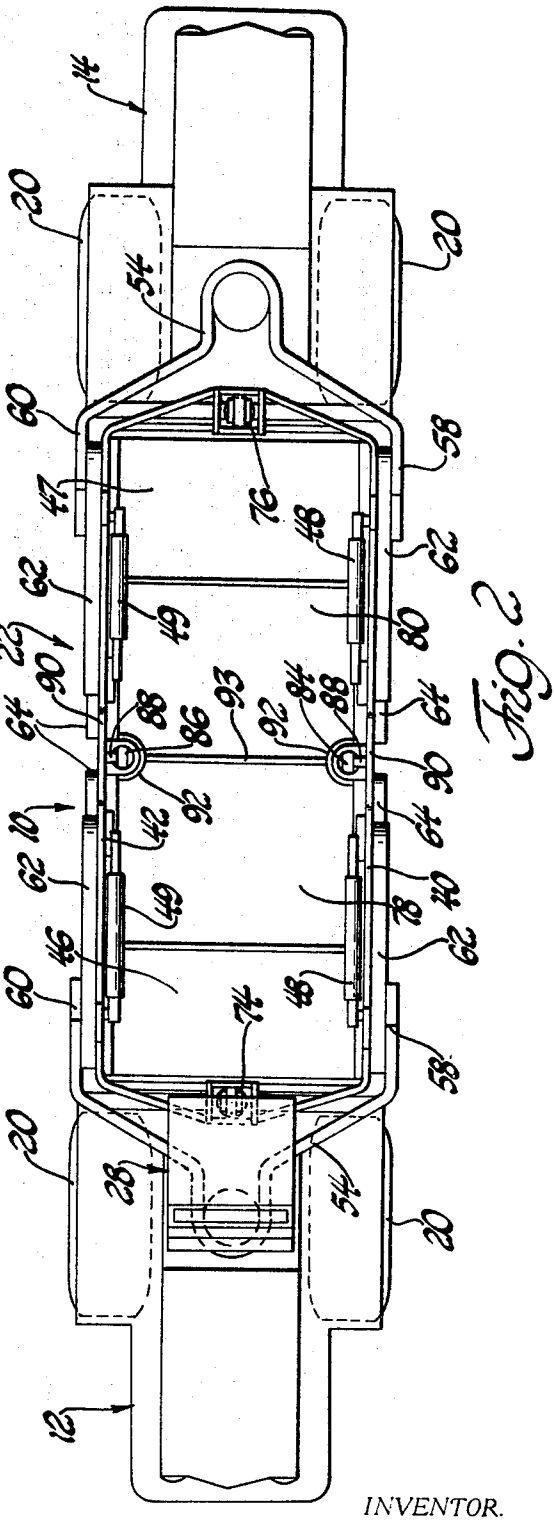

FIG. 2

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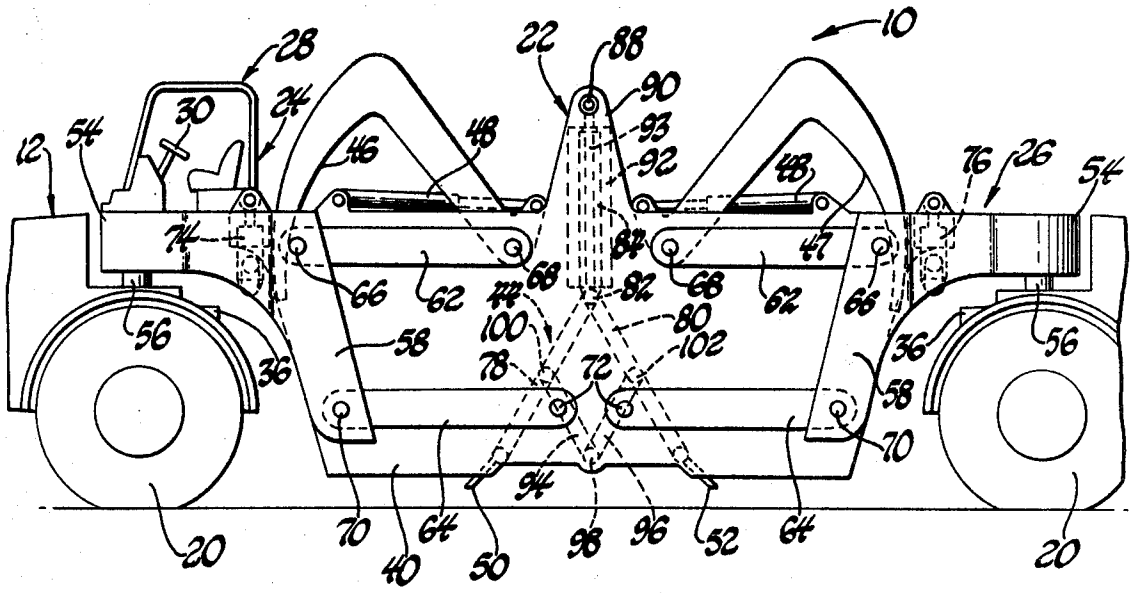

Fig. 3

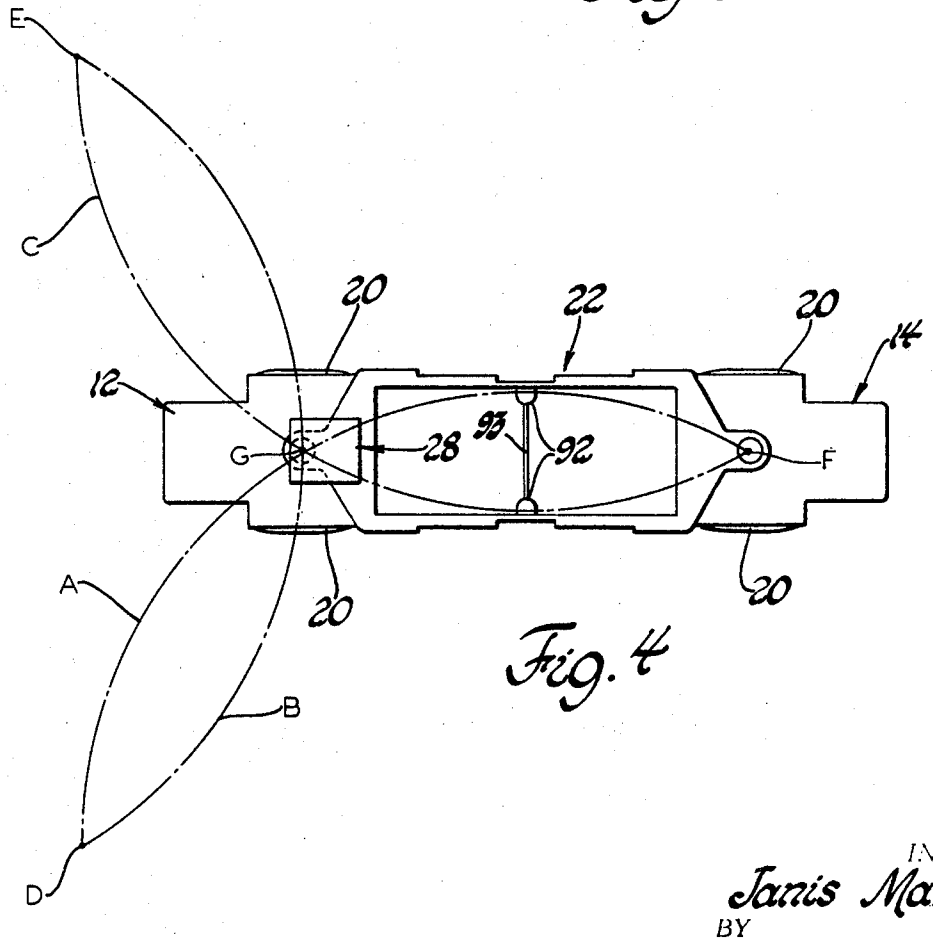

Fig. 4

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SCRAPER

Present scrapers utilized by the earthmoving industry usually consist of a tractor connected through a pull yoke arrangement to a trailing scraper bowl. The tractor can be of the two-axle type or the more common single-axle overhung type, in which case the tractor as a unit is pivotable about a vertical axis for steering purposes. With regard to the latter form of scraper, it has been determined that the length of the load-carrying portion of the bowl is relatively small when compared with the wheel base of the scraper. In other words, the area located between the front and rear wheels of the scraper is devoted primarily to structural support components designed in a manner which eliminates adequate space for material-retaining purposes. In some scrapers, it has been found that as little as 39 percent of the wheel base is utilized for retaining material. Other scrapers, mainly those having two-axle type tractors, may devote a greater percentage of the wheel base to load capacity of the scraper, however, this percentage seldom, if ever, exceeds 50 percent.

Apart from the small percentage of wheel base devoted to load-retaining capacity, present-day scrapers also suffer from the deficiency of requiring a relatively large area in order to made a complete turn. As should be apparent, increased productivity of the scraper is determined to a great extent by how quickly the scraper can be maneuvered into its digging position and also the speed at which it can be completely loaded. Merely lengthening the bowls of the present form of scrapers will not increase their productivity because, beyond a certain bowl length, the loading ability of a scraper diminishes as the bowl length increases. This is due to the fact that the dirt already in the bowl must be pushed toward the rear of the bowl prior to new material entering the bowl. Thus, increased resistance to continued loading of the bowl is encountered.

The present invention is directed to a scraper which is intended to alleviate many of the problems mentioned above. More specifically, the present invention contemplates a scraper in which approximately 65 percent of the wheel base is devoted to the load-retaining capacity and in which increased efficiency is realized during a loading or transporting operation. In the preferred form, the scraper according to this invention includes a bowl that is open at both ends and is supported between a pair of steerable drive units, each of which is connected to the bowl by a king pin that provides for pivotal movement about a vertical steer axis. Each open end of the bowl supports a pivoted apron which is power-operated for opening or closing the mouth of the bowl so as to facilitate a digging operation and to serve as a retaining wall when a loaded bowl is being transported to a dumping area. In addition, both the front end and rear end of the bowl have a scraper blade so that loading of the scraper can occur when it is driven in one direction or in a direction opposite thereto. The bowl is supported at the forward and rearward ends through a parallelogram linkage which permits the cutting blade at either end to be lowered into a dig position for cutting material and causing it to flow into the bowl while ejection of the material is provided by a pair of axially aligned plate sections which normally serve as a horizontal floor for material within the bowl. In this regard, the adjacent ends of the plate sections are connected to each other through a hinge arrangement which in turn is pivotally connected to a vertically oriented power cylinder supported by the bowl. Thus by contracting the power cylinder, the hinge arrangement together with the adjacent ends of the plate sections are raised in a vertical direction so as to cause the free ends of the plate sections to move rearwardly to drop the material out of the bowl.

The objects of the present invention are to provide a scraper having a bowl that can be loaded when the scraper is driven forwardly or rearwardly and includes an ejection system which causes the material to be dropped from the bowl by gravity; to provide a scraper having a bowl that is supported between a pair of drive units, each of which is steerable about a vertical axis and is connected to the bowl by a parallelogram linkage; to provide an ejection system for a scraper bowl capable of being loaded from either end thereof that serves as a horizontal floor for supporting material within the bowl and is divided into hinged sections which can be raised with a bowl dividing wall so as to cause the material to drop by gravity out of the bowl; and to provide a scraper having a material-retaining bowl of a length which is greater than 55 percent of the wheel base of the scraper.

Other objects and advantages of the present invention will be apparent from the following detailed description when taken with the drawings in which:

FIG. 1 is a side elevation view showing a scraper made in accordance with the invention;

FIG. 2 is a plan view of the scraper shown in FIG. 1;

FIG. 3 is a view similar to FIG. 1 but shows the ejection system being operated for discharging a load from the bowl; and

4 is a schematic view showing the path that the scraper of FIGS. 1 and 3 would be driven when making a complete turn.

Referring now to the drawings and more particularly FIGS. 1 and 2 thereof, an earthmoving scraper 10 made according to the invention is shown comprising a front frame or drive unit 12 and a rear frame or drive unit 14 which are respectively supported by rigid transverse axles 16 and 18, the opposite ends of which rotatably support rubber tires 20. Located between the drive units 12 and 14 is a scraper bowl 22, the opposite ends of which are connected to the drive units by draft assemblies 24 and 26. The draft assembly 24 supports an operator's cab 28 which normally faces in the forward direction and includes a steering wheel 30, the rotation of which serves to provide steering movement to the drive units 12 and 14 in a manner to be described hereinafter.

Each of the drive units 12 and 14 includes an engine 32 connected through a suitable shaft 34 to a transmission and gear box assembly 36 which supplies drive through a drive shaft 38 to the associated axle. Thus, the scraper 10 is an all-wheel drive vehicle with suitable engine and transmission controls being located within the operator's cab in a conventional manner.

The scraper bowl 22 comprises the usual laterally spaced side walls 40 and 42 between which is located an ejection system 44 and a pair of aprons 46 and 47, the latter of which serve to selectively open and close the front and rear open ends of the scraper bowl. In this regard, it will be noted that each apron is power operated by a pair of hydraulic cylinders 48 and 49 carried by the scraper bowl 22. In addition, front and rear cutting blades 50 and 52 are provided which extend transversely between the side walls 40 and 42 and, in this case, constitute an integral part of the ejection system 44 which will be explained in more detail hereinafter.

Each of the draft assemblies 24 and 26 includes a drawbar or support frame 54 that extends outwardly from the scraper bowl 22 for pivotal connection with a vertical king pin 56 rigidly mounted on the associated drive unit. The support frame 54 is integrally formed with a pair of downwardly extending side sections 58 and 60, each of which supports an upper arm or link 62 and a lower arm or link 64. The longitudinal axes of the arms 62 and 64 are located in substantially parallel and horizontally extending planes and, as best seen in FIG. 1, the upper arm 62 has one end thereof pivotally connected to the side section 58 by a pivotal connection 66, while the other end is connected to the scraper bowl by a pivotal connection 68 which also serves as a support for the associated apron. Similarly, one end of the lower arm 64 is connected to the side section 58 by a pivotal connection 70, while the other end of the arm is connected to the scraper bowl 22 by a pivotal connection 72. It will be understood that corresponding upper and lower arms are provided along the opposite side of the scraper bowl and are connected between the support frame and scraper bowl in a similar manner. Thus, the upper and lower arms on both sides of the scraper form a parallelogram 4-bar linkage which controls movement of the bowl between a lowered-dig position and a raised-carry position. Movement of the scraper bowl 22 between these two positions is provided by vertically orientated hydraulic bowl

cylinders 74 and 76, each of which has the cylinder portion connected to the support frame 54, while the piston rod is pivotally connected to the scraper bowl 22. By directing fluid to either of the bowl cylinders 74 or 76, selective control of the scraper bowl 22 is provided so that either one end or the other can be lowered into a dig position depending upon the direction of travel of the scraper 10.

The ejection system employed by this scraper comprises a pair of flat plate sections 78 and 80 which extend transversely between the side walls 40 and 42 and are normally located in a horizontal plane, as shown in FIG. 1, so as to serve as a floor portion for retaining the material within the scraper bowl 22. The adjacent or inner ends of the plate sections are hinged together along a transverse axis by a pin 82, the opposite ends of which are respectively connected to the base ends of hydraulic cylinders 84 and 86. The piston rod end of each hydraulic cylinder 84 and 86 is connected by a pivotal connection 88 to a raised part 90 of the scraper bowl. As seen in FIG. 2, a semi-cylindrical housing 92 is connected to the base end of each hydraulic cylinder 84 and 86 and is secured to a transversely extending wall 93 which serves to divide the scraper bowl 22 into two parts. The outer ends of the plate sections 78 and 80 are connected to the blades 50 and 52, respectively, and are adapted to be translated rearwardly under the control of a pair of links 94 and 96, the adjacent ends of which are pivotally connected by a pin 98 to the scraper bowl 22, while the opposed ends are pivotally connected by pivot pins 100 and 102 to intermediate portions of the plate sections 78 and 80. Thus as seen in FIG. 3, when the hydraulic cylinders 84 and 86 are contracted, the plate sections 78 and 80 as well as the wall 93 are raised in a vertical direction causing the load within the scraper bowl 22 to be dropped by gravity. In order to facilitate discharging of the material, the aprons 46 and 47 are placed in the raised position by expansion of the hydraulic cylinders 48 and 49.

From the above description, it should be apparent that the scraper 10 can be driven either forwardly or rearwardly during a scraping operation. Thus, assuming the scraper is moving in a cut toward the left as seen in FIG. 1, it can continue to load until the forward end of the scraper bowl 22 is completely loaded. Thereafter, the operator can operate bowl cylinders 74 and 76 to respectively raise cutting blade 50 and rear cutting blade 52 and have the scraper travel toward the right to load the opposite end of the scraper bowl until it reaches full capacity. It should be noted that in an instance where the scraper 10 is to be completely turned around so that the operator's cab 28 faces toward the right as seen in FIG. 1, the fact that both of the drive units 12 and 14 are steerable about the associated king pin 56 permits the scraper 10 to negotiate the full turnaround by following the paths illustrated in FIG. 4. In this regard, initially the front and rear drive units 12 and 14 will each be rotated about its steer axis, clockwise and counterclockwise, respectively, so that the scraper 10 when driven forwardly follows the curved path identified by the letter A. The operator will follow path A until the front steer axis of the scraper reaches the point D and the rear steer axis is located at point G. Thereafter, the front and rear drive units will be steered relative to the scraper bowl 22 so that the scraper 10 can follow the curved path B. The scraper will then be driven along path B until the rear steer axis reaches point E and the front steer axis reaches point G. Once again, the front and rear drive units 12 and 14 will be steered relative to the scraper bowl 22 so that the scraper can follow a curved path C until the front steer axis is located at point F and the rear steer axis at point G. This simple maneuver permits the scraper 10 to completely reverse its direction in a minimum amount of space.

Various changes and modifications can be made in this construction without departing from the spirit of the invention. Such changes and modifications are contemplated by the inventor and he does not wish to be limited except by the scope of the appended claims.

I claim:

1. An earthmoving scraper comprising a front frame unit and a rear frame unit, a material-handling bowl located between said front and rear frame units, each of said frame units having driven wheels and carrying a vertical king pin for supporting one end of the material-handling bowl, said bowl having an opening at both ends thereof for admitting material into the bowl when the scraper is driven in either direction along its longitudinal axis and including a pair of laterally spaced side walls, a power-operated apron located between said side walls and adjacent each opening in said bowl for opening and closing the opening, an ejector system for discharging material from said bowl, said ejector system comprising a pair of axially aligned plate sections serving as a horizontal floor for the material within the bowl, means interconnecting the adjacent ends of the plate sections for relative pivotal movement about a first horizontal axis, and a power-operated cylinder connected between a point on said bowl and said means for raising said adjacent ends of the plate sections in a vertical direction, and link means pivotally interconnecting an intermediate portion of each of said plate sections to the bowl at a point vertically aligned with said horizontal axis so during said raising of said adjacent ends the free ends of the plate sections are translated rearwardly relative to the adjacent apron to allow the material to drop from the bowl

2. An earthmoving scraper comprising a front frame unit and a rear frame unit, a material-handling bowl located between said front and rear frame units, each of said frame units having driven wheels and carrying a vertical king pin for supporting one end of the material-handling bowl, said bowl having an opening at both ends thereof for admitting material into the bowl when the scraper is driven in either direction along its longitudinal axis and including a pair of laterally spaced side walls, an apron located between said side walls and adjacent each opening in said bowl for opening and closing the opening, an ejector system carried by said bowl for discharging material therefrom, said ejector system comprising a pair of plate sections normally located in a horizontal plane and serving as a floor for the material within the bowl, means interconnecting the adjacent ends of the plate sections for relative pivotal movement about a first horizontal axis, a pair of laterally spaced and vertically orientated power-operated cylinders, means pivotally connecting each of said power-operated cylinders between a point on said bowl and said first-mentioned means for raising the said adjacent ends of the plate sections in a vertical direction while the free ends of the plate sections are translated rearwardly relative to the adjacent apron for dropping the material by gravity from the bowl, and a wall extending transversely to the longitudinal axis of the scraper for dividing the bowl and connected to said pair of power-operated cylinders for movement therewith in a vertical plane.

3. An earthmoving scraper comprising a front drive unit and a rear drive unit each of which is supported on an axle having driven wheels, a material-handling bowl located between said front and rear drive units, each of said drive units having a vertical king pin about which the drive unit is steerable relative to the material-handling bowl, a draft assembly carried by the king pin of each of said drive units and serving to support one end of the material-handling bowl for selective movement between a lowered-dig position and a raised-carry position, said bowl having an opening at both ends thereof for admitting material in the bowl when the scraper is driven in either direction about its longitudinal axis and including a pair of laterally spaced side walls, a power-operated apron located between said side walls and adjacent each opening in said bowl for opening and closing said opening, an ejector system carried by said bowl for discharging material therefrom, said ejector system comprising a pair of flat plate sections normally located in a horizontal plane and serving as a floor for the material within the bowl, means interconnecting the adjacent ends of the plate sections for relative pivotal movement about a first horizontal axis, a pair of laterally spaced and vertically oriented power-operated cylinders, means pivotally connect-

ing each of said power-operated cylinders between a point on said bowl and said first-mentioned means for raising the said adjacent ends of the plate sections in a vertical direction, link means pivotally interconnecting a portion of each of said plate sections to the bowl at a point vertically aligned with said horizontal axis so during said raising of said adjacent ends the free ends of the plate sections are translated rearwardly relative to the adjacent apron to allow the material to drop from the bowl, and a wall extending transversely to the longitudinal axis of the scraper for dividing the bowl and connected to said pair of power-operated cylinders for movement therewith in a vertical plane.

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