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EARTH-MOVING APPARATUS

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Fig. 1.

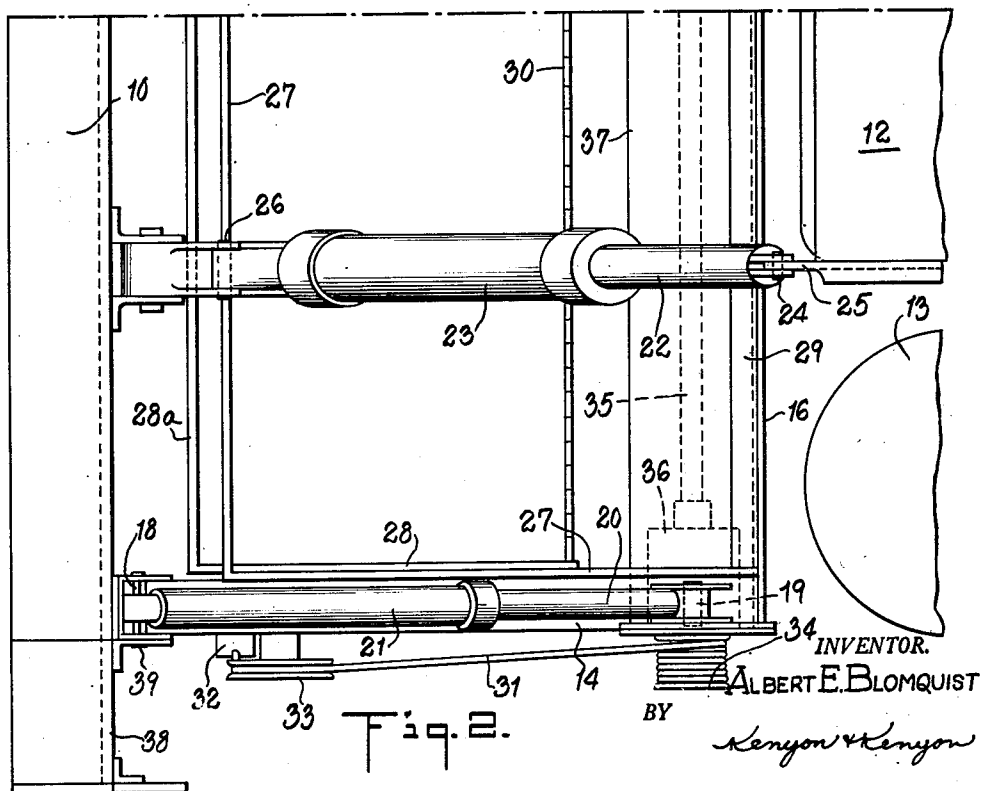
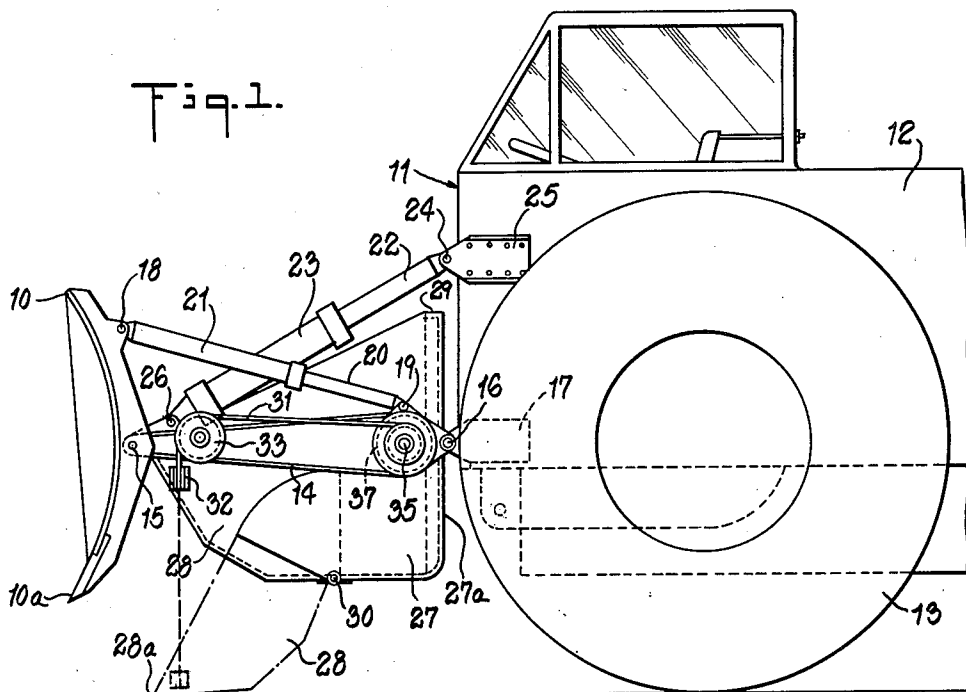


Fig. 2.

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EARTH-MOVING APPARATUS

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7 Claims. (Cl. 37—117.5)

This invention relates to earth-moving apparatus and vehicles and pertains more particularly to earth-moving apparatus of the bulldozer type.

It is an object of this invention to provide earth-moving apparatus which, as manufactured and in condition for shipment, is relatively light in weight and which, at the point of destination, is such that it is capable of being effectively used as a bulldozer.

Earth-moving apparatus such as a bulldozer is subjected to relatively severe forces, not only in the direction of primary thrust but also up and down, which have to be effectively counteracted by the apparatus. Lightness in weight of the scraper blade and associated parts as well as of the propelling vehicle constitutes a decided drawback to the effective use of a bulldozer, although from the point of view of manufacturing cost and facility in shipment lightness in weight is an important consideration. This is particularly the case in connection with military equipment which frequently has to be transported to remote points as by ship, rail, motor transport or even by airplane.

The combination of light weight for shipment and desired stability for effective use as a bulldozer has been afforded according to this invention by utilization of a ballast container in combination with the scraper blade, the vehicle, and the bracket means for holding the scraper blade in front of the vehicle, the ballast container being mounted in back of the scraper blade and comprising a scoop member having a front end portion presenting an earth-scooping edge that is adapted to be lowered and raised so that when in lowered position it is below the lower margin of the scraper blade and is adapted to scoop up earth upon moving the vehicle forwardly. When the front end portion of the scoop member is raised the ballast container is adapted to retain earth therein as ballast, the inertia of which serves to greatly increase the stability and effectiveness of the apparatus in using it as a bulldozer.

While the front end of the scoop member is such that it can be lowered and raised relatively to the scraper blade, nevertheless when the front end of the scoop member is in raised position for retaining earth in the ballast compartment, the ballast compartment as a whole preferably is so mounted that it remains in the same position relatively to the scraper blade as it is moved relatively to the vehicle to which the scraper blade is attached and so that it follows the motion of the scraper blade. Preferably the ballast container is so mounted in relation to bracket means for holding the scraper blade that the means for securing the ballast container to the bracket means is disposed substantially in the line of thrust between the propelling vehicle and the scraper blade.

Further purposes, features and advantages of this invention will be apparent from the following description of the illustrative embodiment thereof that is shown in the accompanying drawings, wherein:

Fig. 1 is a side elevational view of bulldozer apparatus embodying this invention; and

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Fig. 2 is a plan view on a larger scale of half of the apparatus shown in Fig. 1 from the center to one end, the other half being essentially the complement of that shown in Fig. 2.

In the drawings, the scraper blade 10 is mounted in front of the power-driven vehicle, which is indicated generally by the reference character 11. Any desired type of power-driven vehicle may be employed. For purposes of illustration, a vehicle has been shown of the type which has a body that is carried by relatively large power-driven wheels 13. Such a vehicle can be made so as to be relatively light in weight and capable of being driven over very difficult terrain. However, other power-driven vehicles may be employed as, for example, a vehicle equipped with caterpillar treads for providing traction.

In the embodiment shown the scraper blade 10 is mounted in front of the vehicle 11 by bracket means which, adjacent one end thereof, is secured to the scraper blade and is pivotally secured adjacent the other end thereof to the vehicle for permitting the raising and lowering of the scraper blade. This bracket means comprises the arm members 14 to the forward ends of which the scraper blade 10 is pivotally attached by the pins 15. At their rear ends the arm members 14 are attached to the rod 16, which is pivotally held by the mounting plates 17 that are secured to the front end of the body 12 of the vehicle 11.

For tilting the scraper blade 10 relative to each of the arms 14 power-actuated means is employed which is pivotally secured to the upper portion of the scraper blade by the pin 18 and to the rear end of the arm by the pin 19, the power-actuated means being in the form of the piston rod 20 that is adapted to be hydraulically impelled in either direction relatively to the cylinder 21. For elevating and lowering the scraper blade a pair of similar power-actuated means is employed, each being in the form of a piston rod 22 that is adapted to be hydraulically impelled in either direction within the cylinder 23. The piston rod 22 is pivotally held by the pin 24 to the securing plate 25 that is secured to body 12 of the vehicle 11, and the cylinder 23 is pivotally secured by pin 26 to the scraper blade 10. For the sake of simplicity and clarity in the drawings, hydraulic connections to the cylinders 21 and 23 have not been shown, and any conventional hydraulic connection means may be employed.

The ballast container is mounted between the arms 14 and comprises two principal parts, namely, the basin part 27 and the scoop part 28. The basin 27 is secured to the arms in fixed relation thereto by suitable means (not shown), the back wall 27a of the basin 27 being flush with the rod 16 which serves as a reinforcement therefor. The back wall 27a is further reinforced by the angle bars 29.

The scoop 28 constitutes the forward portion of the bottom of the ballast compartment. It is pivotally mounted adjacent the back thereof to the bottom of the basin 27 by hinge 30, which permits the front end portion thereof that comprises the earth-scooping edge 28a to become lowered to the position shown in dotted lines in Fig. 1. For controlling the position of the scoop 28, power-actuated means is employed for lowering and elevating the front end portion thereof. In the embodiment shown, this means comprises the cables 31 which are secured to the front end portion of the scoop 28 by the attaching means 32 and which pass over the pulleys rotatably secured to the arms 14 to the drums 34 for winding the cables 31 thereon. The drums are secured to the opposite ends of the shaft 35 that is rotatably carried by the arms 14 adjacent the rear extremities thereof. The motor 36 is adapted to rotate the shaft 35

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and the drums 34 in either direction as desired by the operator. The motor 36 preferably is a hydraulic motor but may be an electric motor. For simplicity and clarity in the drawing, the lines leading to the motor 36 whereby it is actuated and controlled have not been shown. In order to protect the motor 36 and the shaft 35 from earth in the basin 27, these parts may be surrounded by a protective tube 37.

When the front end portion of the scoop 28 is lowered it is to be noted that the earth-scooping edge 28a thereof becomes disposed at an elevation that is substantially below that of the lower margin 10a of the scraper blade 10. It is thus seen that by lowering the front end of the scoop 28 while the scraper blade is substantially elevated and moving the vehicle forwardly, earth can be scooped up into the scoop 28 and into the basin 27. When the front end portion of the scoop 28 thereupon is raised by winding the cables 31 on the drums 34, the scooped-up earth is retained in the scoop 28 and in the basin 27 which together constitute the ballast container. When the front end portion of the scoop 28 is in raised position, the ballast container and the ballast contained therein follow the movements of the scraper blade during bulldozing operations and remain in the line of thrust between the scraper blade and the vehicle. The inertia imparted by the ballast is, therefore, used with maximum effectiveness at all times regardless of the relative relationship between the scraper blade and the vehicle.

By way of illustration, in the case of relatively lightweight equipment such as a bulldozer having a shipping weight of about 11,000 pounds, the ballast compartment that has been described hereinabove may be made so as to scoop up and retain about 10,000 pounds of earth. By this means the initially lightweight equipment can have its weight nearly doubled by scooping up earth into the ballast compartment at the point of use, thereby greatly increasing the effectiveness of the apparatus for use as a bulldozer. Moreover, the increased weight is carried so as to stabilize the action of the scraper blade itself for preventing it from bobbing up and down and for imparting inertia directly thereto so that it will bite into a body of earth in a way that is both effective and steady.

For facilitating shipment and storage, the scraper blade 10 is provided with extension wings 38 that are attached to the ends of the principal blade, as by bolts 39, in such a way that the wings 38 may be readily attached and detached. By provision of the detachable wing extensions 38, the amount of shipping space required can be substantially reduced.

While this invention has been described in connection with a specific form of apparatus, it is to be understood that this has been done for the purpose of exemplifying a typical embodiment and of illustrating the practice of this invention. It is believed to be apparent from the foregoing that the invention which has been described and exemplified herein may be practiced in connection with many different types of scraper blade, vehicle, bracket means for holding the scraper blade and means for effecting controlled movement of the scraper blade. Moreover, the particular form of the ballast compartment, scoop, and means for lowering and raising the front end portion of the scoop may be varied from that of the exemplary embodiment which has been shown and described hereinabove.

I claim:

1. A bulldozer which comprises in combination a scraper blade, bracket means secured to the back of said scraper blade for holding said scraper blade in front of a propelling vehicle in substantially spaced relation thereto, and a ballast container which is held in secured relation to said bracket means and in back of said scraper blade for imparting the inertia of ballast contained therein to said scraper blade, said ballast container com-

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prising a member mounted for movement relative to said bracket means and to said scraper blade between a first position adapted to retain ballast in said container when said scraper blade is being used for moving earth responsive to propulsion of said vehicle and a second position adapted for scooping up earth into said container responsive to propulsion of said vehicle.

2. A bulldozer according to claim 1 wherein the means for securing said ballast container to said bracket means is disposed substantially in the line of thrust between said propelling vehicle and said scraper blade.

3. A bulldozer which comprises in combination a scraper blade, a propelling vehicle, bracket means disposed between said scraper blade and said vehicle which is secured adjacent one end thereof to said scraper blade and is pivotally secured adjacent the other end thereof to said vehicle for permitting the raising and lowering of said scraper blade together with the forward end of said bracket means, and a ballast container carried by said bracket means behind said scraper blade and movable therewith when said scraper blade is raised and lowered, said ballast container comprising a scoop member presenting an earth-scooping edge at one end thereof, means for pivotally mounting said scoop member for lowering and raising said end of said scoop member relative to said bracket means and to said scraper blade, said earth-scooping edge of said scoop member when said end of said scoop member is lowered being disposed at a lower elevation than the lower margin of said scraper blade and disposed for scooping up earth into said scoop member, and said ballast container being adapted to retain scooped-up earth therein when said scoop member is disposed with said end thereof in raised position.

4. A bulldozer which comprises in combination a scraper blade, a pair of arms secured to the back of said scraper blade and extending rearwardly therefrom, a ballast container disposed between said arms in back of said scraper blade, means for maintaining said ballast container in fixedly secured relation to said arms, a scoop member which is comprised in the lower forward portion of said ballast container and which is pivoted adjacent the rear thereof so that the front end thereof can be lowered and raised relative to said arms and to said scraper blade, said front end of said scoop member when lowered presenting an earth-scooping edge which is at a lower elevation than the lower margin of said scraper blade, and power-actuated means in secured relation to said arms for lowering and raising, as aforesaid, said front end of said scoop member, said ballast container being adapted to retain scooped-up earth therein when said front end of said scoop member is in raised position.

5. A bulldozer which comprises in combination a scraper blade, a propelling vehicle, a pair of spaced arms pivotally secured to the back of said scraper blade adjacent the approximate mid point of the vertical extent thereof for permitting rocking movement of said scraper blade relative to said arms and pivotally secured to said vehicle for permitting the raising and lowering of said scraper blade together with the forward ends of said arms, power-actuated means connecting the said arms adjacent the rear end thereof with said scraper blade in the upper portion of the vertical extent thereof for rocking said scraper blade relative to said arms, power-actuated means connecting said vehicle with said scraper blade for raising and lowering said scraper blade and the forward ends of said arms, a basin member disposed between said arms and fixedly secured thereto adapted to receive earth as ballast, a scoop member hingedly secured adjacent the rear thereof to the said basin member adjacent the bottom thereof and extending forwardly and having an earth-scooping edge adjacent the front end thereof, power-actuated means carried by said arms and connected to said scoop member for lowering and raising the front end of said scoop member relative to said arms

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and to said basin member, said front end of said scoop member when lowered being disposed at a level substantially below the lower margin of said scraper blade and in position for scooping up earth thereon upon propelling said vehicle, and said scoop member when said front end thereof is raised together with said basin member providing a container disposed behind said scraper blade adapted to retain earth therein as ballast.

6. A bulldozer which comprises in combination a scraper blade, a propelling vehicle, bracket means for holding said scraper blade in front of said vehicle, means for securing said scraper blade to the forward end of said bracket means, hinge means for securing the rearward end of said bracket means to said vehicle for permitting the raising and lowering of said forward end of said bracket means, a ballast container and means for mounting said ballast container in back of said scraper blade and between said scraper blade and said hinge means for movement with said bracket means and said scraper blade when they are raised and lowered and for imparting the inertia of ballast contained in said ballast container to said scraper blade, said ballast container comprising a member that is movably mounted relative to said bracket means and scraper blade between a first position adapted to retain ballast in said container when said scraper blade is used for earth moving purposes and a second position adapted for scooping up earth into said container responsive to forward propulsion of said vehicle.

7. A bulldozer which comprises in combination a scraper blade, a propelling vehicle, bracket means for holding said scraper blade in front of said vehicle, means for securing said scraper blade to the forward end of said

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bracket means, hinge means for securing the rearward end of said bracket means to said vehicle for permitting the raising and lowering of the forward end of said bracket means, and a ballast container carried by said bracket means by securement thereto closely adjacent the back of said scraper blade and forwardly from said hinge means for movement with said bracket means when the forward end of said bracket means is raised and lowered and for imparting inertia of ballast in said container to said scraper blade, said ballast container comprising a member that presents a forwardly directed earth-scooping edge and that is hingedly mounted for movement between one position with said earth-scooping edge at a lower elevation than the lower margin of said scraper blade for scooping up earth into said container and a second position adapted for retaining scooped-up earth in said container means to impart its inertia to said scraper blade when said scraper blade is used for moving earth.

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