

# United States Patent

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[54] **SCRAPER ELEVATOR LIFTING AND CUSHIONING MECHANISM**

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[51] Int. Cl. ....**B60p 1/36**

[58] Field of Search .....37/4, 8; 267/63; 198/117

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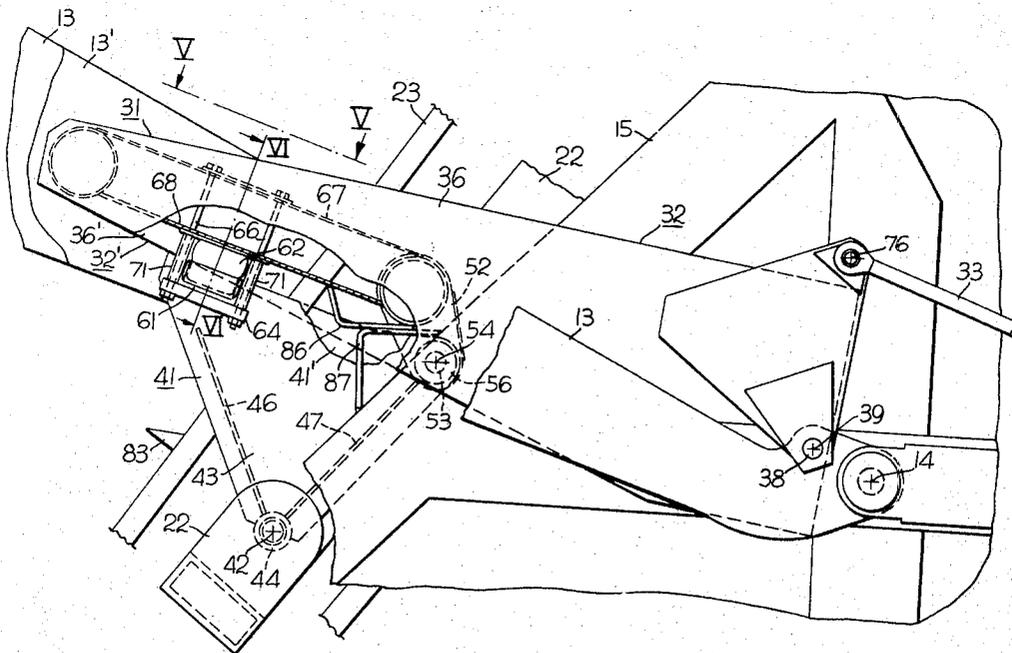
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[57] **ABSTRACT**

The elevator of an elevating type scraper is supported at the open front end of the bowl by linkage permitting upward and rearward swinging movement to a raised position in which it is sufficiently high to permit the ejector to move forward in the bowl during the unloading operation. The linkage for raising and lowering the elevator includes cushioning means operative to cushion the elevator against shock when rocks or other large objects are encountered during the excavating operation.

**10 Claims, 7 Drawing Figures**



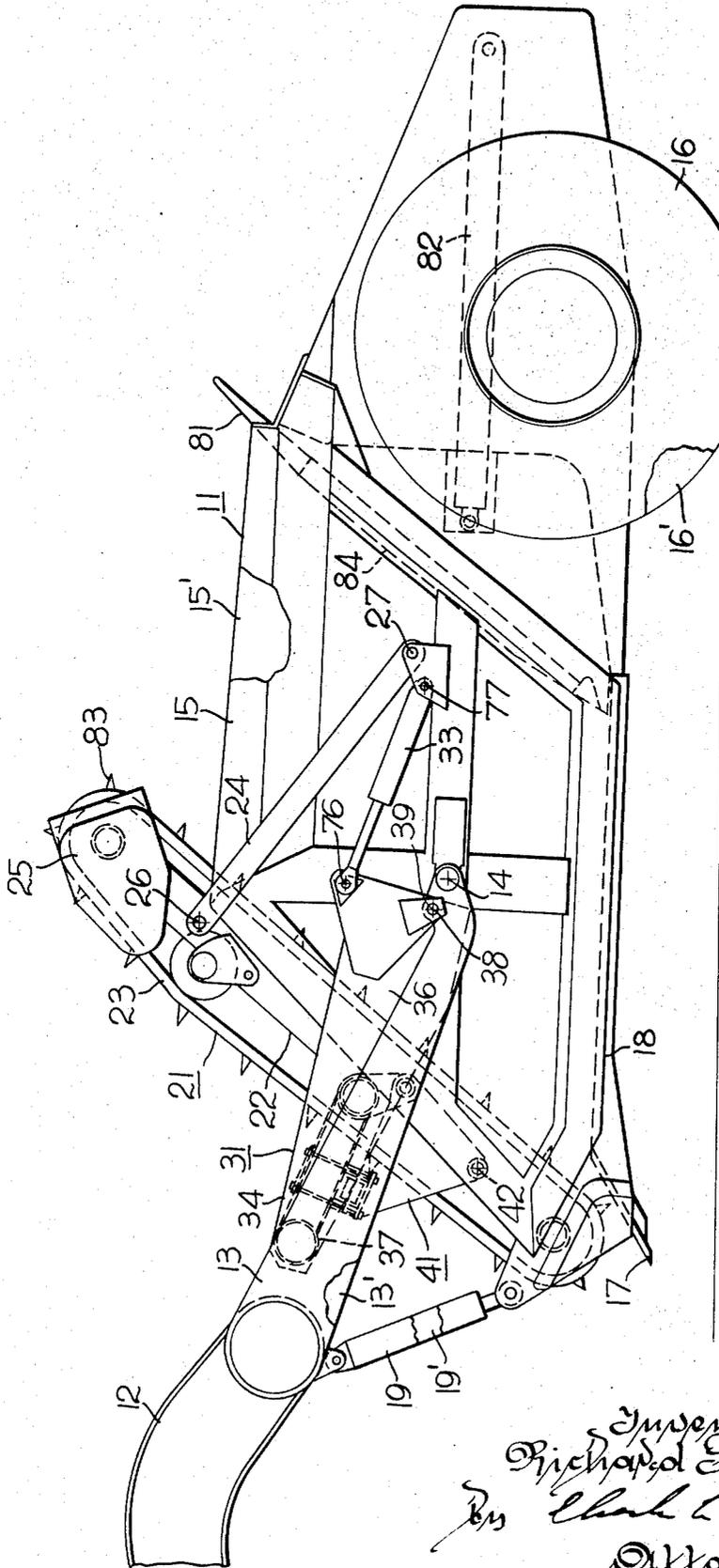


Fig. 1

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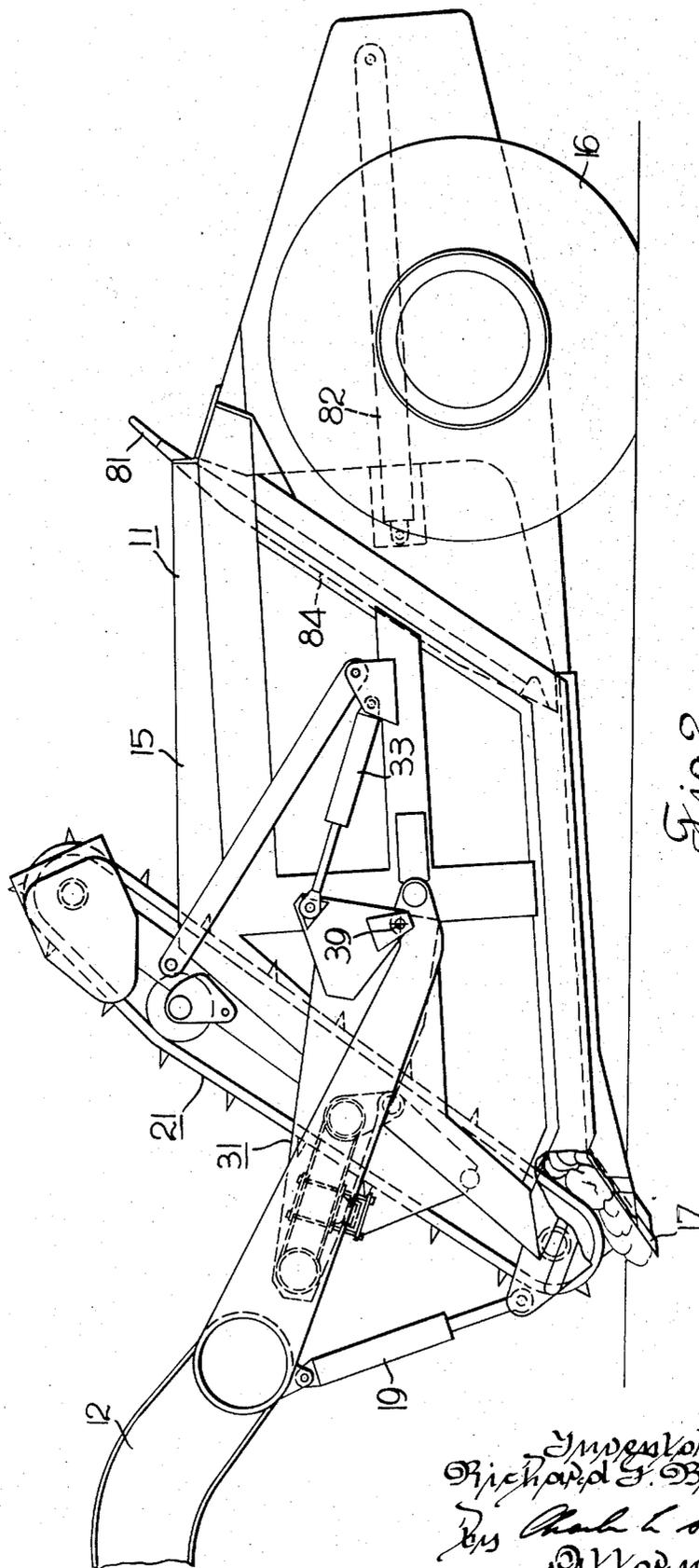


Fig. 2

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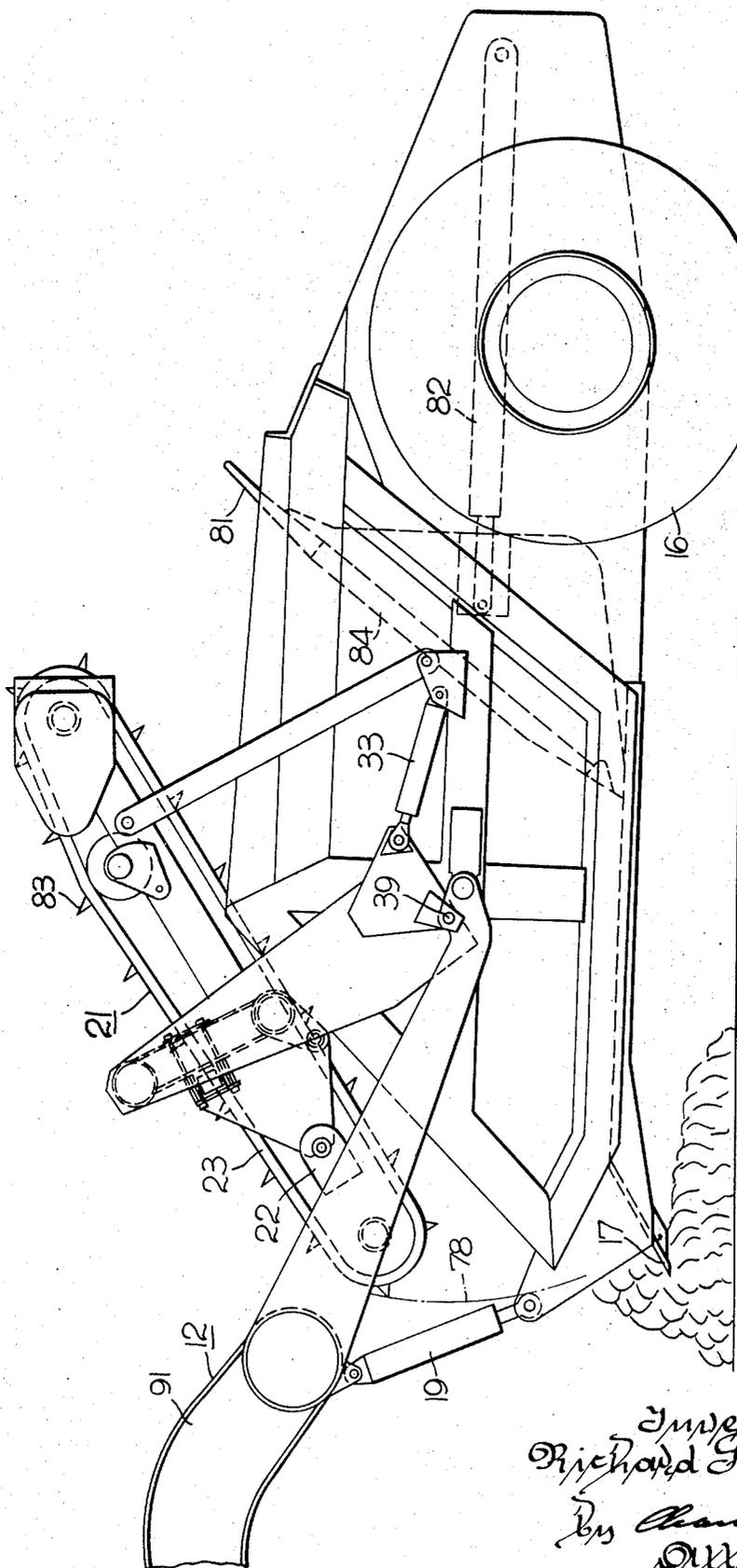


Fig. 3

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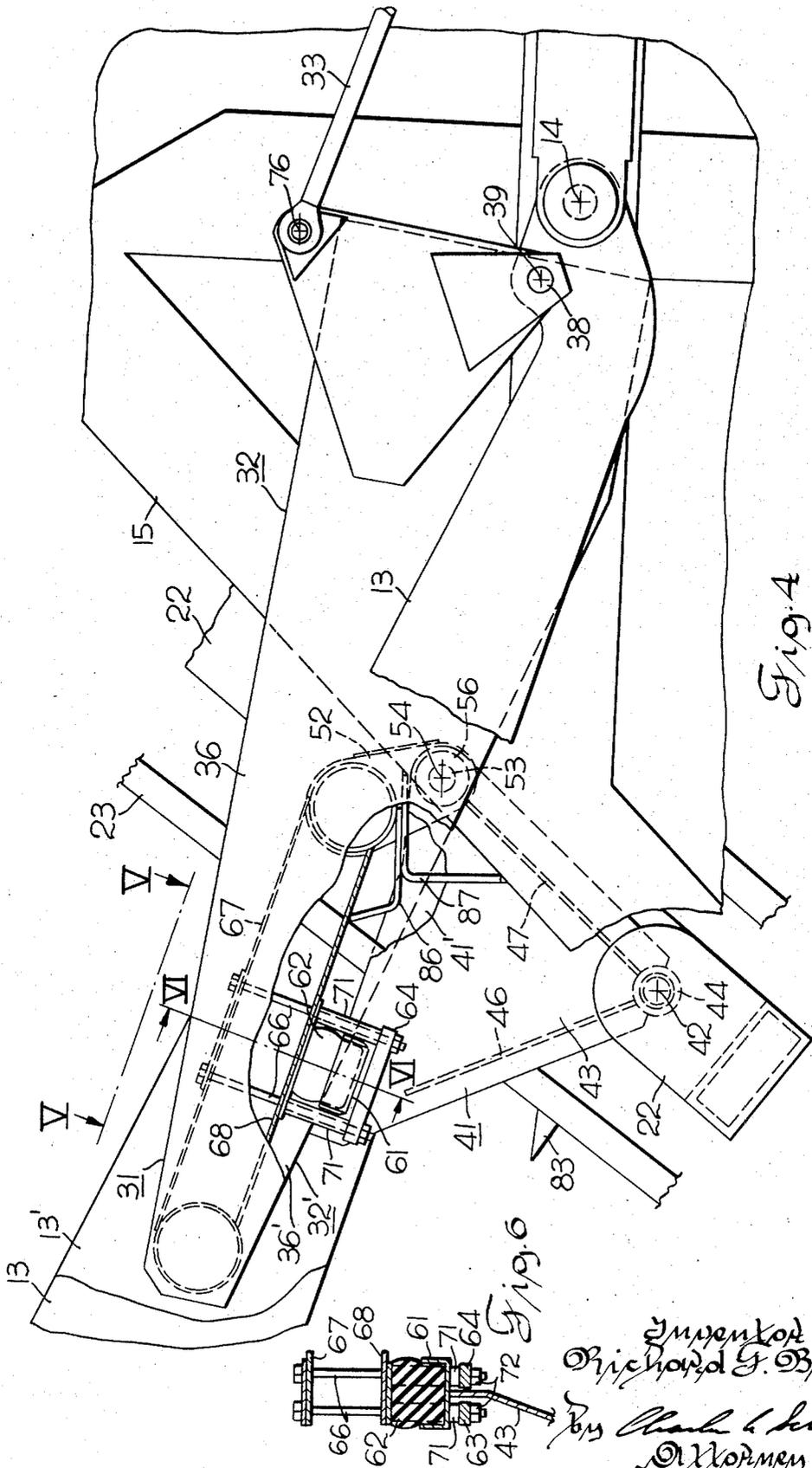


Fig. 4

Fig. 6

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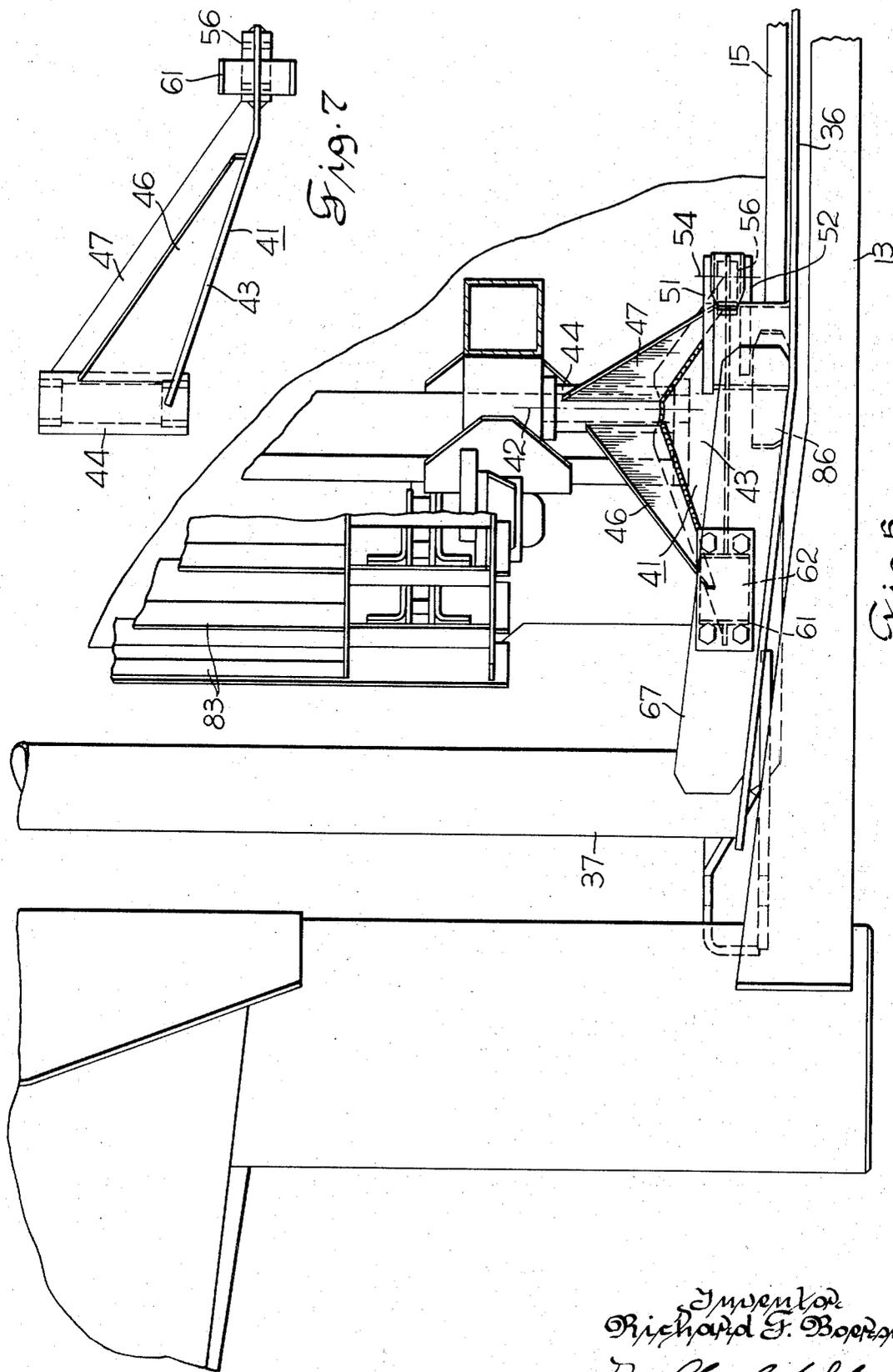


Fig. 7

Fig. 5

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## SCRAPER ELEVATOR LIFTING AND CUSHIONING MECHANISM

This invention relates to an improved elevating scraper and particularly to an improved lifting and cushioning mechanism for the elevator.

Heretofore others have provided lifting and cushioning mechanisms for elevators of motor scrapers which have been mounted in various ways on the lift frame or bowl side walls. When operating a scraper having lift linkage for the elevator, on the draft frame raising and lowering movement of the bowl cutting edge (which is achieved by relative movement between the draft frame and bowl) will cause the elevator to change its position relative to the cutting edge. This is not a desirable result, for instance, when the bowl is raised inasmuch as the elevator is forced against the cutting edge or bowl bottom, thus creating excessive pressures in the hydraulic lift jacks for the elevator. Heretofore others have used downwardly and rearwardly extending arms which are rigidly secured to the elevator frame and pivotally connected to the bowl side walls. When the elevator of such prior design is swung upwardly it swings in a substantial forward arc, thus requiring additional length in the draft frame as compared with a scraper with elevator supported by a quadrilateral linkage.

It is a primary object of this invention to provide an improved lifting and cushioning mechanism for a scraper elevator.

It is a more specific object of the present invention to provide a lifting and cushioning mechanism for a scraper elevator which is not adversely affected by the raising or lowering movement of the scraper bowl between excavating and transport positions.

It is an object of the present invention to provide a support linkage for a scraper elevator which permits the elevator to be swung upwardly for scraper ejection and which permits a relatively short overall scraper length.

It is a further object of the present invention to provide a lifting and cushioning mechanism for an elevator of an earthmover which is superior in operation and performance and is relatively easy to service.

These and other objects of the present invention will be apparent from the following description when read in conjunction with the drawings in which:

FIG. 1 is a partial side view of a scraper incorporating the present invention;

FIG. 2 is a side view of the scraper shown in FIG. 1 with the scraper bowl lowered to an excavating position;

FIG. 3 is a side view of the scraper shown in FIGS. 1 and 2, showing the elevator raised and the ejector being moved forwardly to eject material from the bowl;

FIG. 4 is an enlarged side view of part of the scraper showing detail of the lifting and cushioning mechanism;

FIG. 5 is a section view taken along the lines V—V in FIG. 4;

FIG. 6 is a section view taken along the lines VI—VI of FIG. 4; and

FIG. 7 is an end view of part of the elevator lift linkage.

Referring to FIG. 1, the scraper includes a bowl 11 and a draft frame 12 having a pair of rearwardly extending arms 13, 13' which are pivotally connected to

the side walls 15, 15' of the scraper bowl 11 on a transverse axis 14. The bowl 11 is supported at its rear end by a pair of rubber tired wheels 16, 16'.

A transversely extending cutting edge 17 is secured to the front end of the bowl bottom wall 18. The bowl 11 is raised and lowered between its transport position shown in FIG. 1 and the excavating position shown in FIG. 2 by a pair of double-acting hydraulic jacks 19, 19' which are pivotally connected at their corresponding upper ends to the draft frame 12 and at their corresponding lower ends to the front end of the bowl side walls 15, 15'. The draft frame 12 is connected to a towing tractor, not shown, which includes an operator's station, pressurized hydraulic fluid supply, controls for the lift jacks 19, 19' and for other hydraulic jacks hereinafter described.

An elevator 21 is provided at the open front end of the bowl 11 to assist in loading excavated material, as shown in FIG. 2. The elevator 21 includes a frame 22 and an endless belt 23 which is driven by reversible hydraulic motor and transmission assembly 25.

The elevator is raised and lowered, and also shifted longitudinally of the bowl, by a quadrilateral linkage including links 24 and a lift mechanism 31. The pair of links 24, only one of which is shown, pivotally connect the frame 22 and the side walls 15 of the bowl 11 through pivot pins having transverse axes 26, 27. The lift mechanism 31 includes a pair of two-part linkages 32, 32' operated by a pair of double-acting jacks 33, only one of which is shown. As shown in FIGS. 1 through 5, the linkages 32, 32' include a pair of longitudinally extending link parts 36, 36' rigidly interconnected by a transverse cylindrical member 37 which acts as a torsion bar. The rear ends of the link parts 36, 36', are pivotally connected to the rear end of the draft frame arms 13, 13' by pivot pins 38 having a transverse pivot axis 39. A pair of second parts 41, 41' of the elevator lifting linkage 32, 32' have their bottom corners pivotally connected, respectively, on a transverse axis 42 to the elevator frame 22. The triangularly shaped linkage part 41 is fabricated by welding together a substantially vertical plate 43, pivot housings 44, 56 and struts 46, 47. As shown in FIGS. 4 through 7, the link part 41 has its pivot housing 56 at its rear corner pivotally connected to a pair of downwardly extending flanges 51, 52 of linkage part 36 by a pivot pin 53 having a transverse pivot axis 54. The front corner of the linkage part 41 includes a cup 61 in which a block 62 of flexible rubberlike cushioning material is disposed. When the earthmover is excavating as shown in FIG. 2, the elevator may be forced upwardly by the material being excavated (assuming the elevator has been lowered by the hydraulic jacks 33 to a proper position and the controls therefor placed in hold) and such upward movement will be cushioned by compression of cushion block 62. Beneficial cushioning will also occur if the controls for the lift jacks 33 are placed in float since fluid cannot escape from the jacks fast enough to prevent shock loading of the elevator. Downward swinging motion of the linkage part 41 about its pivot axis 54, on which connected to link part 36, is positively restrained by a pair of bars or stops 63, 64, which engage the underside of cup 61 shown in FIGS. 4 and 6, which are held in a rigid position relative to the linkage part 36 by four bolts 66 extending

through suitable openings, not shown, in horizontal flanges 67, 68 of the link part 36, through hollow spacers 71 and through stops 63, 64. The bolts 66 are held in place by suitable nuts 72.

Although only linkage 32 has been described in detail, it should be understood that linkage 32' comprised of parts 36' and 41' is the reverse image of linkage 32. It should also be noted that linkage part 36 is disposed laterally between the draft frame arm 13 and the bowl side wall 15 and linkage part 41 is disposed on the laterally inner side of side wall 15.

The double-acting hydraulic jacks 33 are operable to raise the elevator 21 to its raised position shown in FIG. 3 wherein the ejector 81 may be moved forwardly by the double-acting hydraulic jack 82 without interference with the elevator. The jack 33 is pivotally connected at its forward end to linkage part 36 by a pivot pin having a transverse axis 76 spaced above transverse axis 39. The rear end of the jack 33 is pivotally connected on a transverse axis 77 to the side wall of the scraper bowl 11. It should be noted that as the elevator is raised, its front end swings on an arc 78 shown in FIG. 3. Thus, the front end of the elevator moves almost directly upwardly when raised. As shown in FIG. 4, a pair of abutment members 86, 87 are provided to limit downward swinging movement of linkage part 36 relative to the scraper bowl 11. Stop 86 is welded to the linkage part 36 and stop 87 is welded to the top of side wall 15.

By employing the quadrilateral linkage of this invention, the front end of the elevator does not move forwardly to any appreciable extent as the elevator is raised. This permits the forward part of the scraper bowl to be longitudinally near the gooseneck 91 of the draft frame 12, thereby reducing overall length of the earthmover. The major portion of linkages 32, 32' lie outside the bowl 11, thus avoiding interference with loading of the bowl and avoiding exposure to wear which would be occasioned by contact with excavated material. The parts 41, 41' are disposed within the bowl to achieve the proper pivot connection with the elevator frame 22 for the desired path of upward swinging motion, arc 78, on raising the elevator.

### OPERATION

When it is desired to excavate material, the jacks 19, 19' are extended so as to lower the scraper bowl 11 and the cutting edge 17 to the excavating position shown in FIG. 2. The controls for the elevator jacks 33 include a valve, not shown, having raise, lower, hold and float positions; thus during loading the elevator can be held in either a float condition or a hold position to provide the desired loading characteristics.

After the scraper is loaded, the bowl 11 is raised by contracting lift jacks 19 to place the bowl in the carry position shown in FIG. 1. After the scraper has been driven to the unloading site, the elevator 21 will be raised by contracting the jacks 33, as illustrated in FIG. 3, and the ejection jack 82 will be extended so as to move the ejector 81 forwardly in the scraper bowl. During this time the scraper is operated in a forward direction so as to evenly spread the material being ejected. Upon completion of the ejection, the elevator 21 may be lowered, with the ejector 81 still in the forward position, and operated in reverse so as to permit

the transverse slats 83 of the elevator endless belt 23 to scrape any accumulation of clay, or other clinging substance, from the front face of the transverse push blade 84 of the ejector 81. Upon completion of unloading of material from the bowl, the ejector 81 is retracted by a contracting ram 82 and the elevator 21 may be lowered by expanding rams 33, thereby conditioning the elevator and scraper bowl for an additional loading operation.

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

1. In a scraper having a wheeled bowl with front opening defined by a bottom wall with a leading cutting edge and side walls, a draft frame having a pair of rearwardly extending arms pivotally connected to said side walls and an elevator disposed in said opening, means mounting said elevator comprising:

support means pivotally connecting said elevator to said side walls of said bowl, and mechanism for lifting and cushioning said elevator including

lift linkage having

a first pair of longitudinally extending parts pivotally connected at their rear ends to opposite lateral sides of said scraper on a first transverse axis, and

a second pair of longitudinally extending parts pivotally connected, respectively, to said first pair of parts, respectively, on a second transverse axis, and pivotally connected to said elevator on a third transverse axis,

a pair of lost motion connections between said first and second pairs of parts allowing limited relative pivotal movement therebetween about said second axis,

cushioning means between said first and second pairs of parts affording cushioning for said limited relative pivotal movement, and

power means operable to raise and lower said elevator between raised and lowered positions.

2. The invention of claim 1 wherein said power means comprises a pair of double-acting hydraulic jacks pivotally interconnecting said bowl and said first pair of parts, respectively.

3. The invention of claim 1 and further comprising an ejector movable between a rearward load receiving position and a forward eject position having a transversely extending push blade with a front face sloping upwardly and rearwardly from said bottom wall of said bowl and wherein said elevator is operable to remove material adhering to said front face when said ejector is in said forward eject position and said elevator is operated in reverse in its lowered position.

4. The invention of claim 1 wherein said first pair of parts of said linkage are disposed, respectively, laterally between said arms and side walls.

5. The invention of claim 4 wherein said first pair of parts are pivotally connected to said arms, respectively, near the rear ends of the latter.

6. The invention of claim 5 wherein said power means includes a pair of hydraulic jacks pivotally connected, respectively, to said first pair of parts at points above said first axis.

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7. The invention of claim 1 wherein said linkage includes a transverse member disposed above the forward part of said elevator and wherein said first pair of parts are rigidly secured to opposite transverse ends thereof.

8. The invention of claim 1 wherein said support means includes a pair of forwardly and upwardly inclined links having their rear ends pivotally connected to said side walls and their forward ends pivotally connected to said elevator.

9. The invention of claim 1 wherein said second pair

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of parts are each of triangular configuration with corresponding rear corners pivotally connected, respectively, to said first pair of parts with corresponding bottom corners pivotally connected to said elevator and with corresponding front corners having lost motion connections, respectively, with said first pair of parts.

10. The invention of claim 9 wherein said cushioning means includes resilient members disposed, respectively, between said front corners and said first pair of parts.

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