Aug. 8, 1961

L. E. SHUMAKER ET AL

2,994,975

EARTH SCRAPER AND CARRIER

Filed Jan. 21, 1960

3 Sheets-Sheet 1

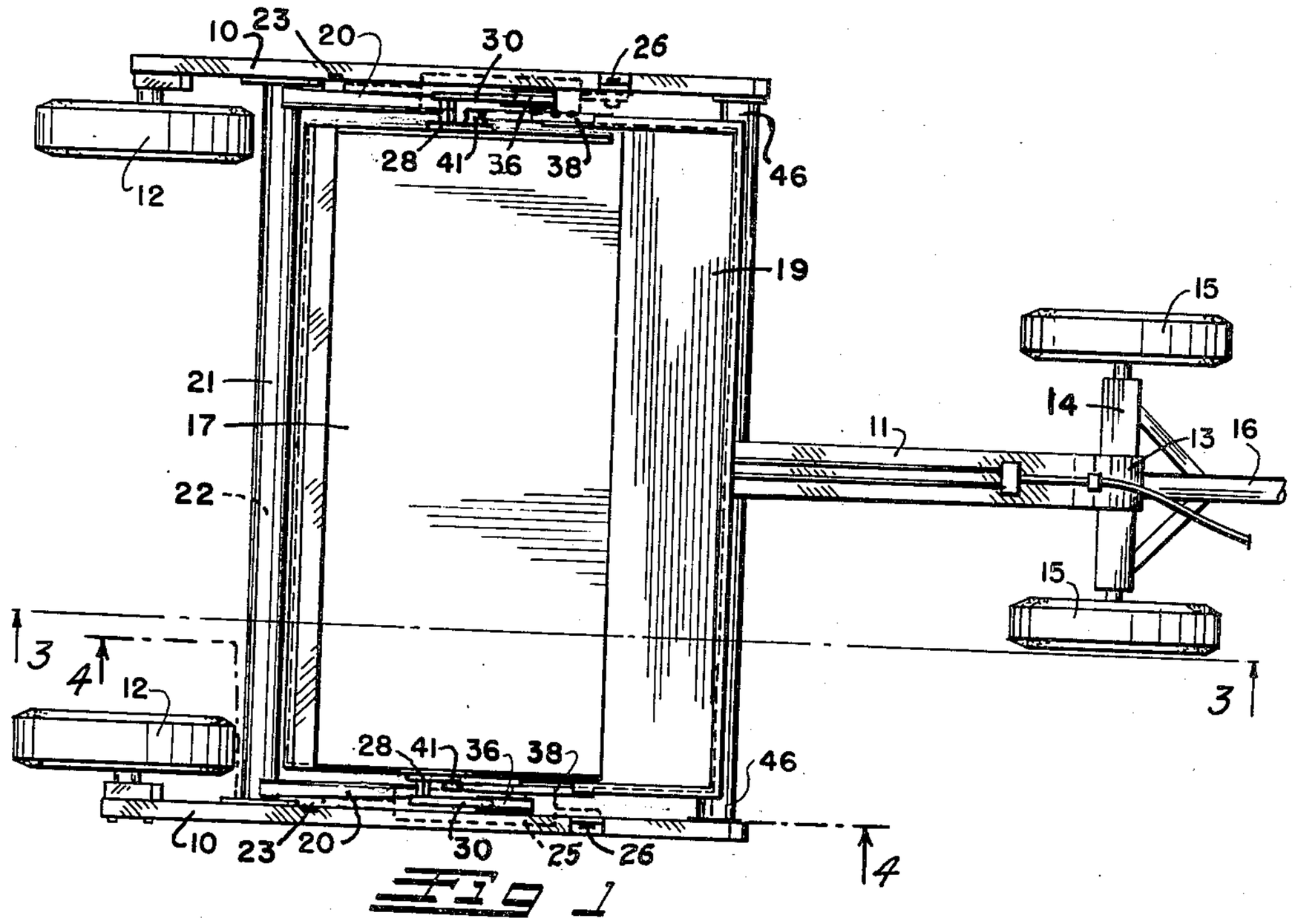

Fig 1

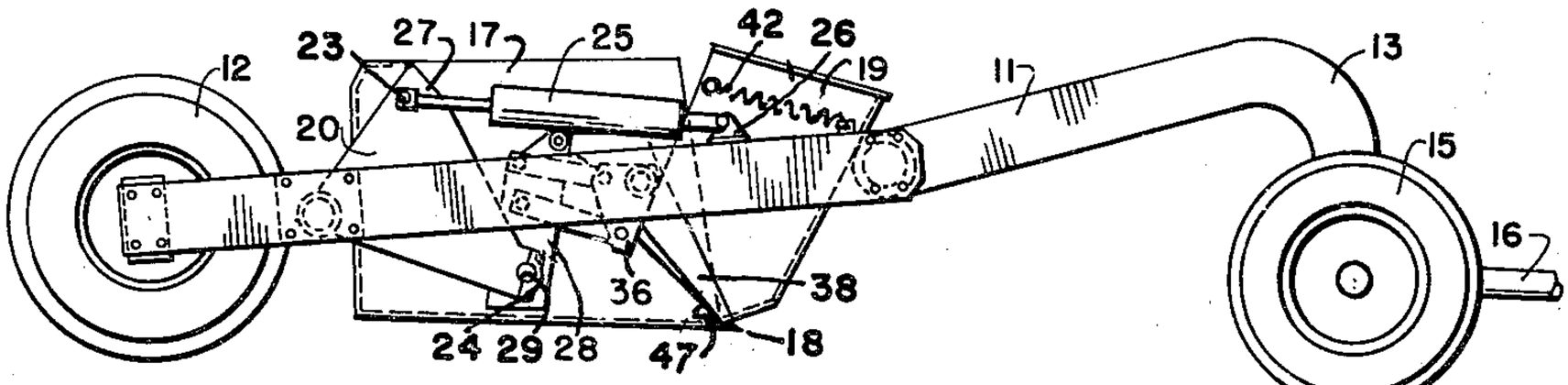

Fig 2

Fig 3

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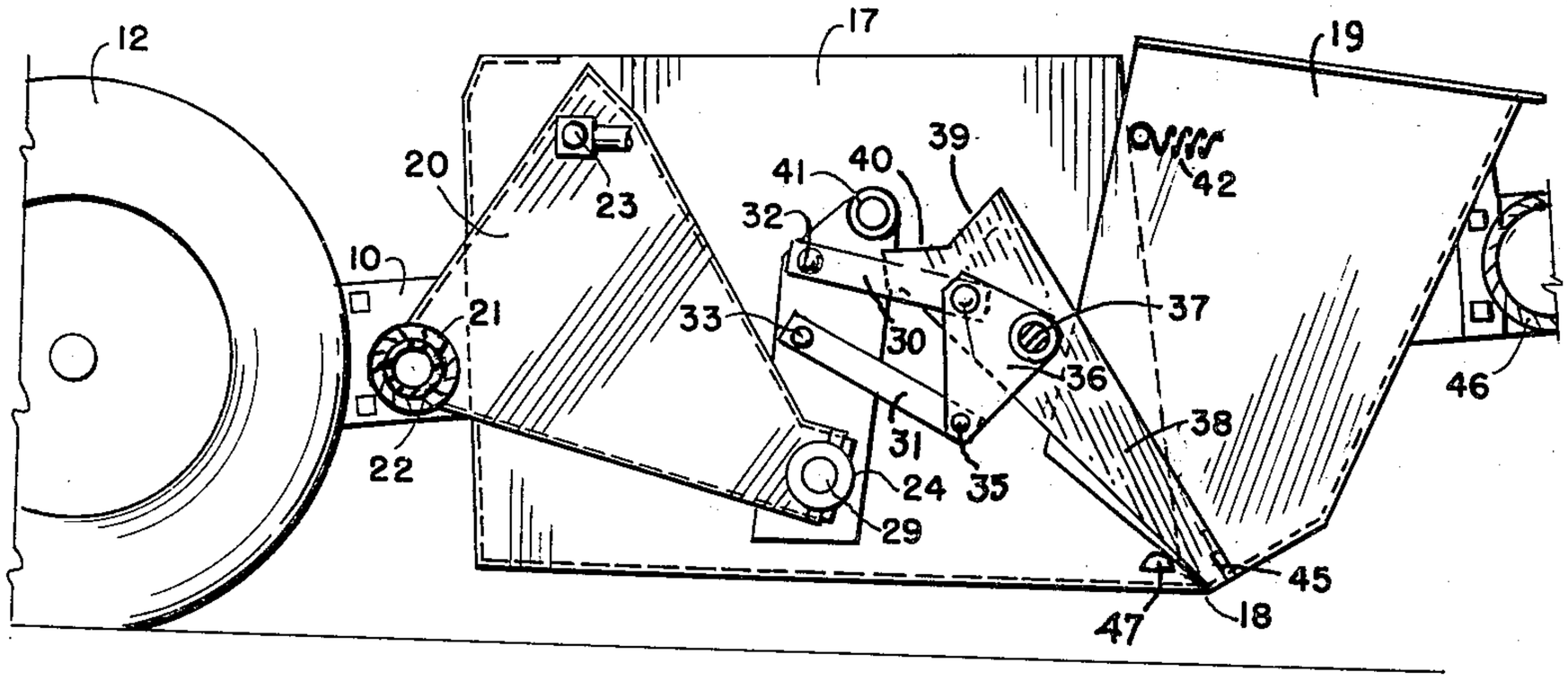

FIG 4

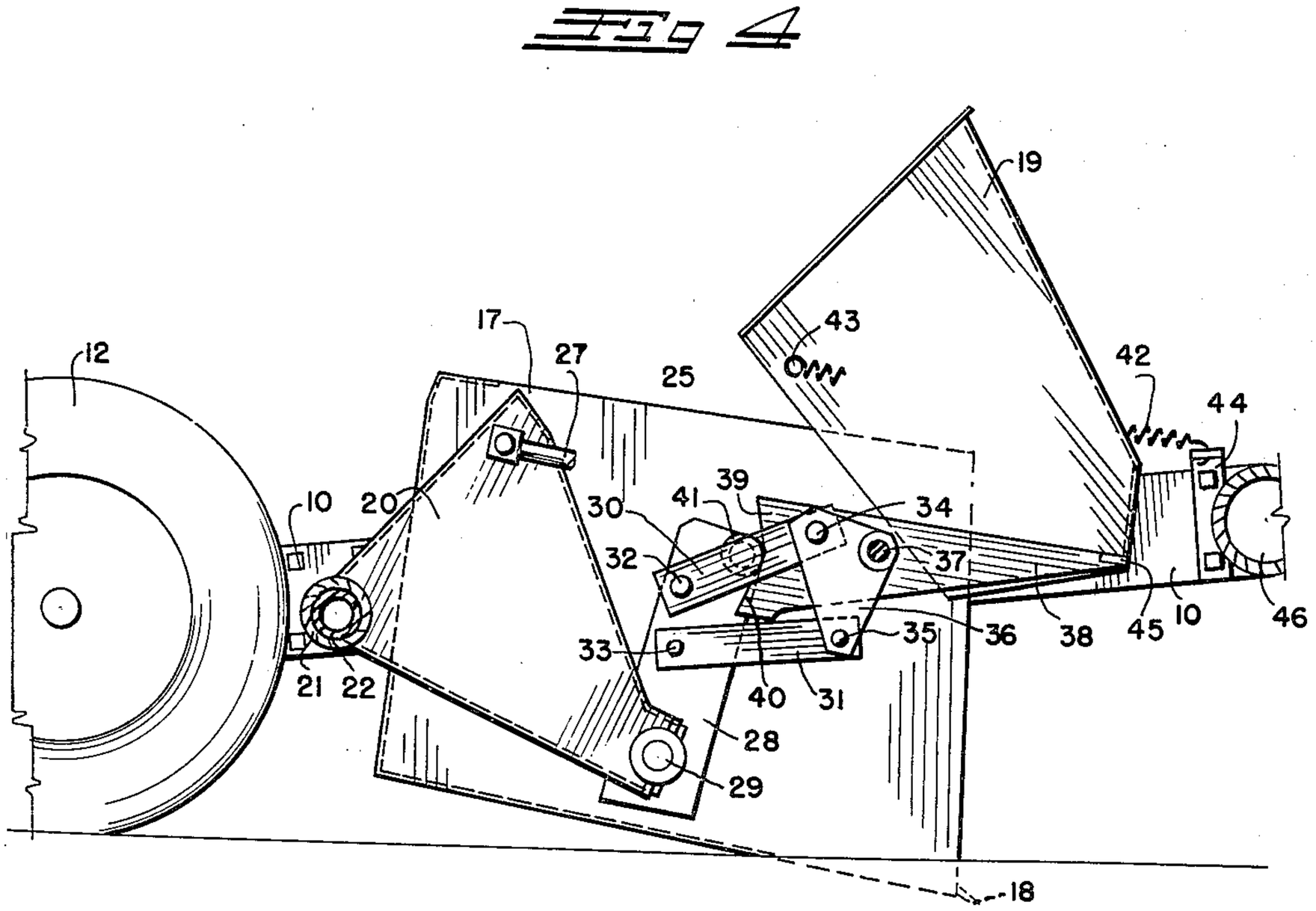

FIG 5

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3 Sheets-Sheet 3

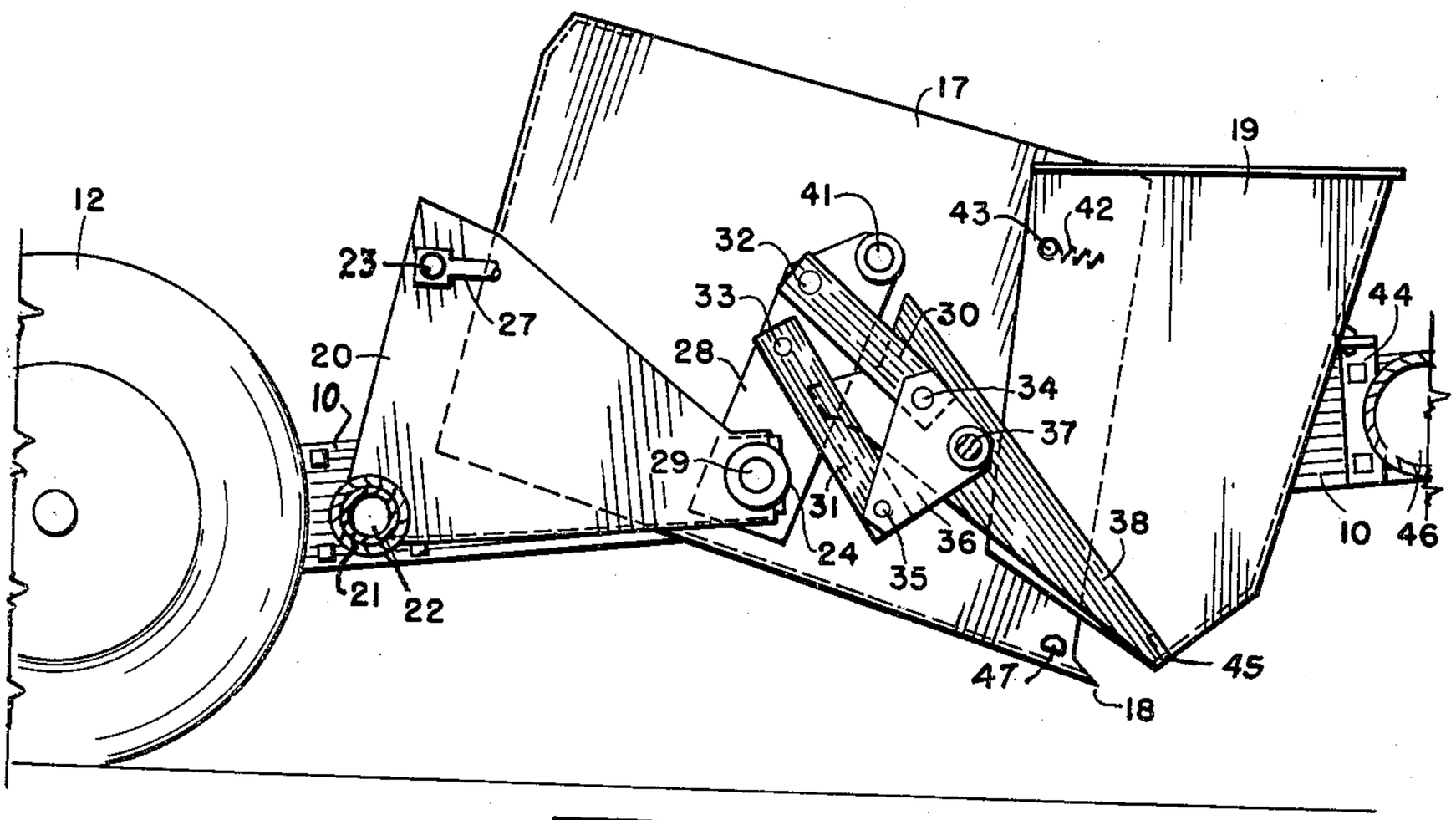

FIG 6

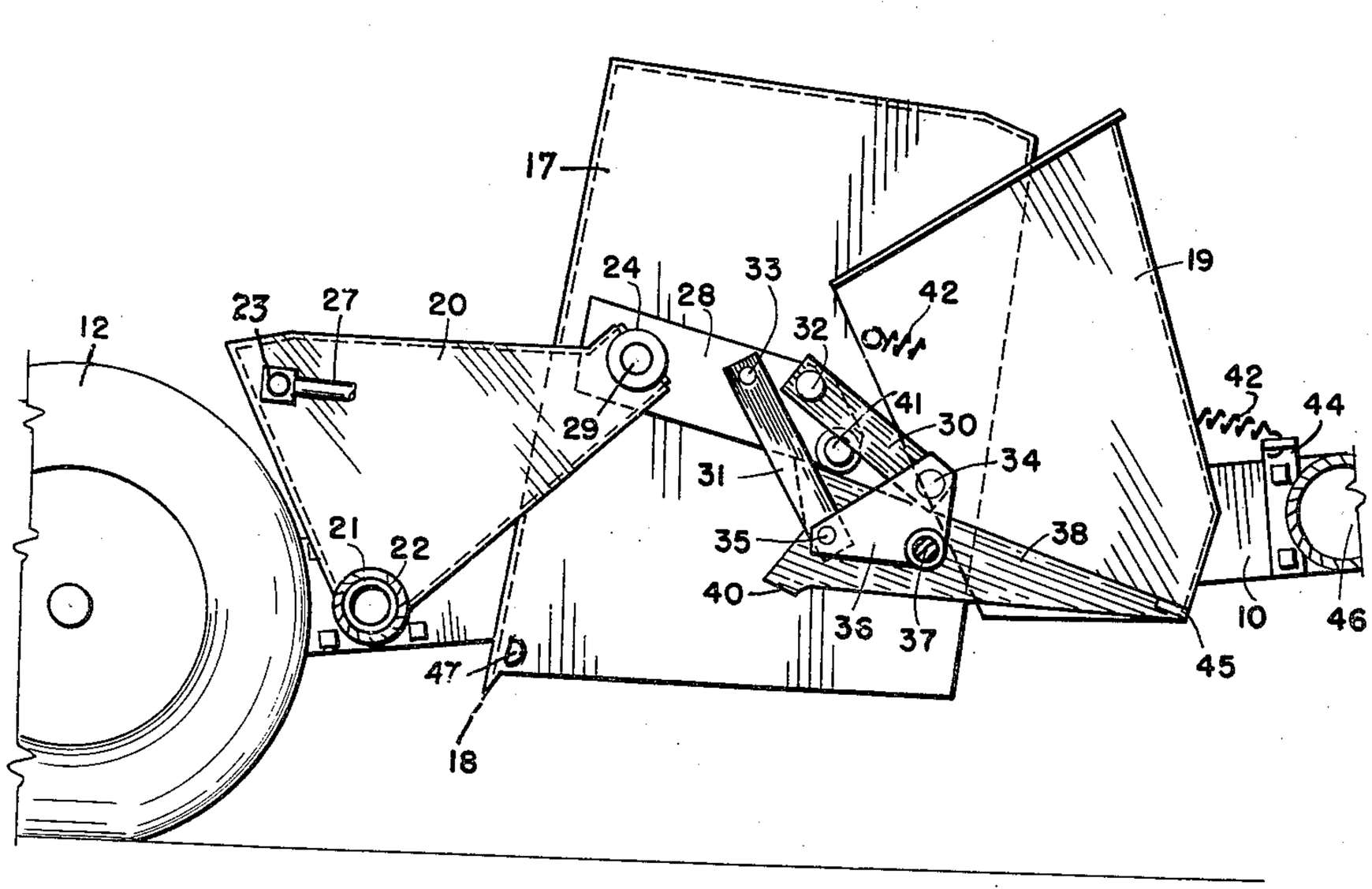

FIG 7

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EARTH SCRAPER AND CARRIER

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Filed Jan. 21, 1960, Ser. No. 3,798
5 Claims. (Cl. 37—126)

This invention relates to an earth scraper for attachment to a towing tractor vehicle provided with hydraulic pressure controls and more particularly to an earth scraper of the type illustrated and described in copending application Serial No. 712,253, now Patent No. 2,941,318.

Earth scrapers of this type comprise a wheeled trailer frame provided with a bucket having a relative sharp forward digging edge for loosening the earth to fill the bucket and with a gate which swings to close the front of the bucket to retain the pile of earth therein during transportation.

The principal object of this invention is to provide a highly efficient linkage between the trailer frame and the bucket which will automatically maintain the bucket at the most effective digging angle, when the bucket is in the earth scraping position, and at the most efficient earth carrying angle, when the bucket is in the transport position.

A further object of the invention is to provide a connecting linkage between the bucket and the gate which will be economical to manufacture and assemble, sturdy and rugged for heavy construction uses, and which will operate automatically in consequence of the movements of the bucket to provide full opening in the digging and dumping positions of the bucket, full closure during the transport position thereof, and accurate, controlled intermediate openings for earth spreading purposes.

Other objects and advantages reside in the detail construction of the invention, which is designed for simplicity, economy, and efficiency. These will become more apparent from the following description.

In the following detailed description of the invention, reference is had to the accompanying drawings which form a part hereof. Like numerals refer to like parts in all views of the drawings and throughout the description.

In the drawings:

FIG. 1 is a plan view of the improved earth scraper with its bucket in the closed or transport position and with actuating hydraulic cylinders for the bucket shown in broken line so as not to conceal linkage therebelow;

FIG. 2 is a side view thereof;

FIG. 3 is a longitudinal section taken on the line 3—3, FIG. 1;

FIG. 4 is an enlarged fragmentary longitudinal section of the midportion of the improved scraper taken on the line 4—4, FIG. 1 showing the bucket in the closed or transport position;

FIG. 5 is a similar sectional view of the mid-portion of the scraper illustrating the bucket in the digging or scraping position;

FIG. 6 is a similar sectional view illustrating the bucket in an intermediate or earth scattering position; and

FIG. 7 is a similar view illustrating the bucket in the full dump position.

The improved scraper comprises a U-shaped main frame consisting of two side frame members **10** extending rearwardly from a tubular cross frame member **46**, a stem beam **11** extends medially forward from the tubular cross frame member **46**. The rear extremities of the side frame members **10** are supported on suitable rear wheels **12**. The forward extremity of the stem beam

11 is curved downwardly as indicated at **13** and terminates in any suitable pivotal towing attachment. The downwardly curved forward extremity **13** of the stem beam **11** may be pivotally mounted on a suitable tractor or other towing vehicle. In the form illustrated, it is pivotally mounted on a dolly frame **14** supported on dolley wheels **15** and provided with a suitable towing tongue **16**.

A rectangular, transversally-elongated scoop-like bucket **17** is pivotally mounted between the side frame members **10**. The bucket **17** is closed at the bottom, the ends and at the back and is open at its front and top. The forward edge of the closed bottom of the bucket is provided with an earth scraping knife edge **18**. A hood shaped gate **19** is also pivotally mounted between the sides of the main frame forwardly of the bucket **17**. The gate **19** is closed at its ends and front and is open at the top, the rear and the bottom.

This invention relates more particularly to the structure and elements employed for mounting the bucket **17** and the gate **19** between the side frame members **10**. The latter structure comprises two hollow, triangular bell crank members **20** fixedly mounted on and extending radially and in alignment from the extremities of a rotatable shaft tube **21** surrounding a tubular horizontal brace strut **22** extending between the side frame members **10** at the rear of the bucket **17**.

Each bell crank member **20** is provided with an outwardly extending eccentrically positioned plunger pivot **23** and with an eccentrically positioned shaft bearing **24**. The shaft tube **21** and the bell crank member **20** are arranged to be controllably rotated by means of suitable hydraulic cylinders **25**, there being one of the hydraulic cylinders **25** hingedly mounted on a hinge bracket **26** on each side frame member **10**. The cylinders actuate plungers **27** which extend rearwardly to pivotal mountings on the plunger pivots **23** of the bell crank members **20**. It can be seen that rearward movement of the plungers **27** will cause upward movement of the shaft bearings **24**. Hydraulic fluid is conducted to the hydraulic cylinders through suitable control valves as is conventional in the art.

A reinforcing pad **28** is welded to each side of the bucket **17** from each of which a bucket pivot stud, which will be herein designated as a bucket pivot **29**, projects. The bucket pivots are rotatably mounted in the shaft bearings **24** of the bell crank members **20** so as to rotatably support the bucket **17** between the bell crank members **20** so that rearward rotation of the bell crank members will cause upward movement of the bucket.

The angle of tilt or incline of the bucket is automatically controlled by means of an upper connecting link **30** and a lower connecting link **31** at each side of the bucket. The links **30** and **31** are pivotally mounted at their rear extremities on link studs **32** and **33**, respectively, formed on and projecting outwardly from each reinforcing pad **28**.

The links **30** and **31** are pivotally connected at their forward extremities on spaced-apart pivots **34** and **35**, respectively, mounted in triangular compensating plates **36**. Each compensating plate is pivotally mounted upon a link pivot stud **37** on the inner face of one of the side frame members **10**.

To accomplish this the desired movements of the bucket **17**, the upper links **30** are relatively shorter than the lower links **31** and the pivot studs **32** and **33** are separated a lesser distance apart than the pivots **34** and **35**.

The gate **19** is carried between two gate lever members **38** each of which is welded along the lower edge of one of the closed sides of the gate and projects rearwardly therefrom. The rearwardly projecting portions of the gate lever members **38** are pivotally mounted, rearward

of the gate, upon the link pivot studs **37** to pivotally support the gate between the side frame members **10** forward of the bucket **19**. The gate lever members are provided with cam notches **39** in their rear extremities and with cam surfaces **40** at the rear of their lower edges. The cam notches **39** and the surfaces **40** are connected by cam rollers **41**, there being one of the rollers **41** mounted on and projecting outwardly from each of the reinforcing pads **28** in spaced relation to the pivot studs **32** and **33** thereon. The forward lower edge of the gate **19** is constantly urged downwardly by means of tension springs **42**, there being one of the tension springs **42** at each side of the gate. The springs **42** are tensioned between spring studs **43** on the gate and spring straps **44** on the side frame members **10**. The maximum upward movement of the gate is limited by means of stop lugs **45** which project oppositely outward from the forward extremities of the gate lever members **38** so as to contact the lower edges of the side frame members **10** to limit upward movement of the gate.

Operation

Let us assume that the bucket is in the "deep dig" position of FIG. 5. It can be seen that forward movement will cause the knife edge **18** to shear a layer of earth into the bucket. When the latter is filled, hydraulic fluid is admitted to the cylinders **25** to rotate the bell cranks upwardly. The initial upward movement causes the axis of the bucket pivots to move forwardly as it rises and the axes of the link studs **32** and **33** to move rapidly rearward as they rise. The result is that the forward edge of the bucket swings upwardly while the rear remains stationary to bring the bucket quickly to the horizontal position of FIG. 4.

As the forward portion of the bucket rises, the cam rollers **41** will swing upwardly and rearwardly from the cam surfaces **40** of the gate lever members **38** to allow the springs **42** and gravity to urge the lower edge of the gate against the front edge of the bucket (as shown in FIG. 4) to prevent spilling of the load.

Further rearward rotation of the bell crank members causes the upper extremities of the links **30** and **31** to swing forwardly to tilt the bucket away from the gate for scattering or spreading purposes as shown in FIG. 6.

Still further rearward rotation of the bell crank levers swings the bottom of the bucket rapidly upward to a vertical position and beyond to quickly dislodge and discharge the load as shown in FIG. 7. The cam rollers **37** swing downwardly into contact with the gate lever members **38** to tilt them against the bias of the springs **42** and away from the bucket to provide wide clearance for quick dumping as shown in FIG. 7.

While a specific form of the improvement has been described and illustrated herein, it is to be understood that the same may be varied within the scope of the appended claims, without departing from the spirit of the invention.

Having thus described the invention what is claimed and desired secured by Letters Patent is:

1. An earth scraper and carrier comprising: two spaced-apart side frame members; a bell-crank shaft rotatably mounted and extending between said frame members; a bell-crank member fixedly mounted adjacent each extremity of said shaft and extending upwardly and forwardly therefrom in alignment with each other; means for rotating said shaft at desired intervals; a scoop-shaped bucket pivotally mounted between said bell-crank members forwardly of said shaft; two connecting links pivotally mounted at their one extremities on and at each side of said bucket; a pivot stud extending inwardly from each side frame member; a compensating plate rotatably mounted on each pivot stud; and a pair of spaced-apart pivot members mounted in each compensating plate eccentric of the axis of said pivot stud so as to impart a tilting action to said bucket in consequence of the rotation of said bell-crank members, the second extremity of each of said links being pivotally mounted on one of said pivot members to provide an extensible connection between the bucket and the frame members.

2. An earth scraper and carrier as described in claim 1 in which the connecting links at each side of the bucket are positioned in vertically spaced relation and in which the uppermost link at each side is shorter than the lower link, the difference in lengths being compensated for by relative rotation between said compensating plates and said links as said bell-crank member rotates upwardly and downwardly.

3. An earth scraper and carrier as described in claim 1 having a gate device pivotally mounted intermediate its height on and extending between said side frame members forwardly of said bucket; spring means urging the lower portion of said gate device toward said bucket to close the front of the latter; and cam means on the sides of said bucket acting to force said gate device away from said bucket and against the bias of said spring when said bell-crank members are rotated upwardly to dump said bucket.

4. An earth scraper and carrier as described in claim 3 in which the cam means comprises: a gate lever member secured at each side of and adjacent the bottom of said gate device and extending rearwardly of the pivot points of said gate device; and a cam follower mounted on each side of said bucket and positioned to contact the gate lever member at that side when the bucket tilts forwardly to dump its contents.

5. An earth scraper and carrier as described in claim 4 having a reinforcing plate welded to each side of said bucket; a bucket pivot projecting outward from each plate to pivotally mount the bucket between the bell-crank members; two links studs projecting outwardly from each plate to provide the pivotal mounting for the rear extremities of the connecting links; and a cam roller mounted on and projecting outwardly from each plate to provide the cam follower member.

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