

May 8, 1962

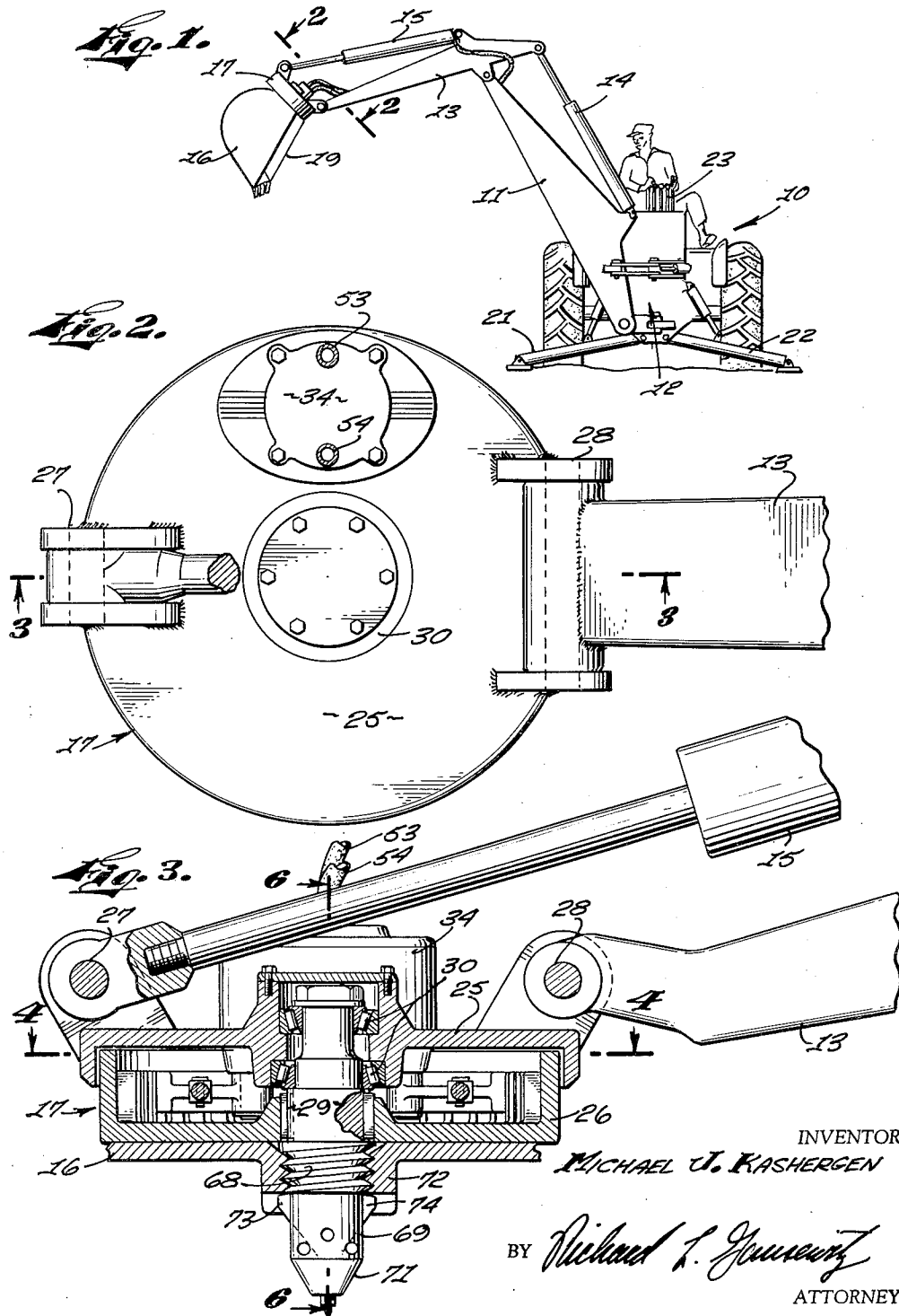
M. J. KASHERGEN

3,033,394

MULTIPURPOSE APPARATUS FOR EARTHWORKING AND THE LIKE

Filed June 29, 1959

5 Sheets-Sheet 1



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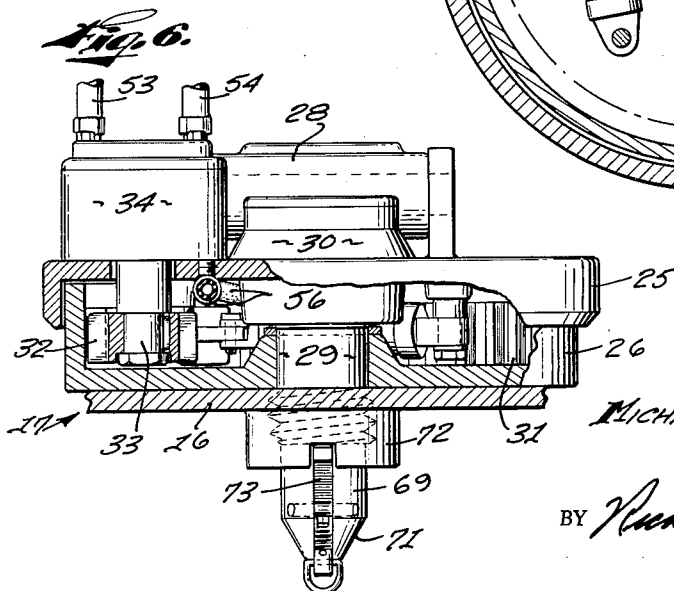
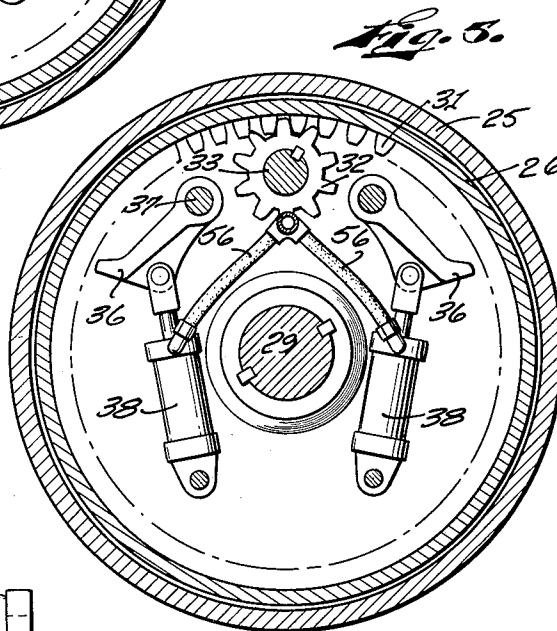
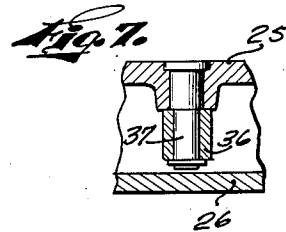
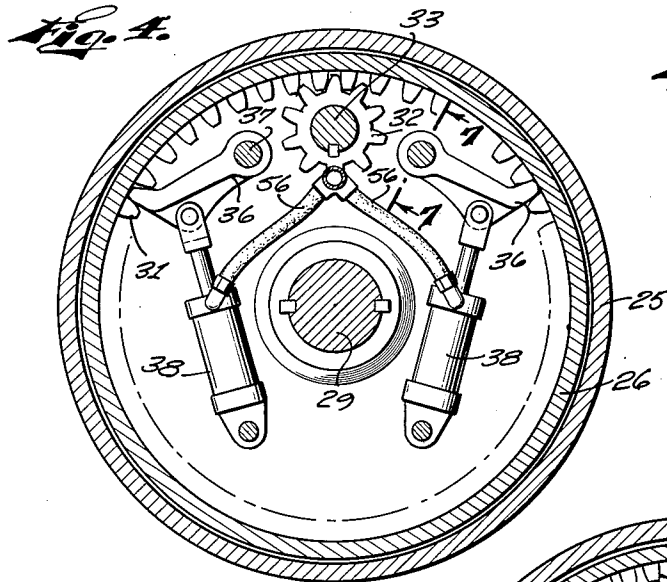
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MULTIPURPOSE APPARATUS FOR EARTHWORKING AND THE LIKE

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5 Sheets-Sheet 2



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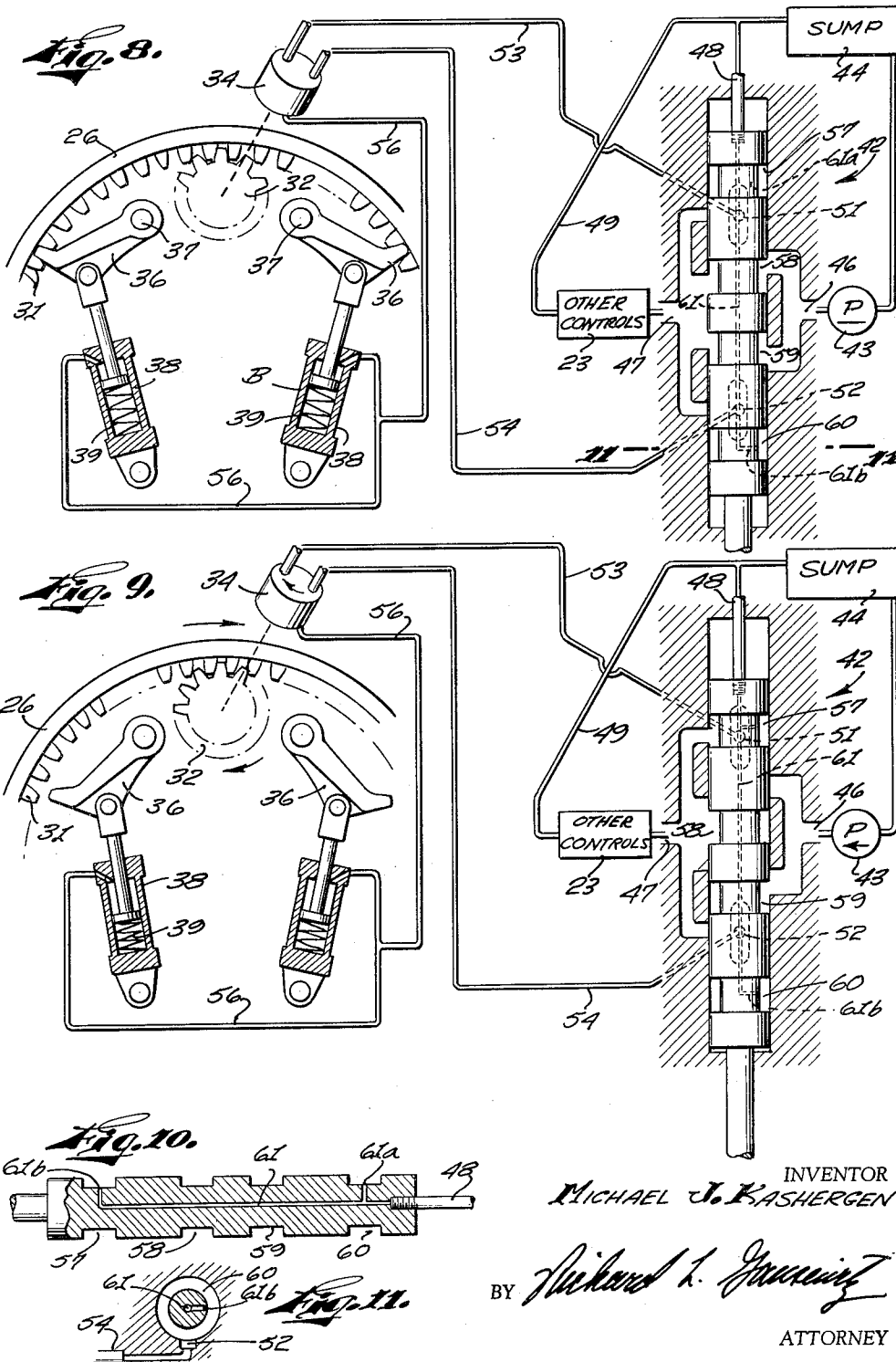
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MULTIPURPOSE APPARATUS FOR EARTHWORKING AND THE LIKE

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5 Sheets-Sheet 3



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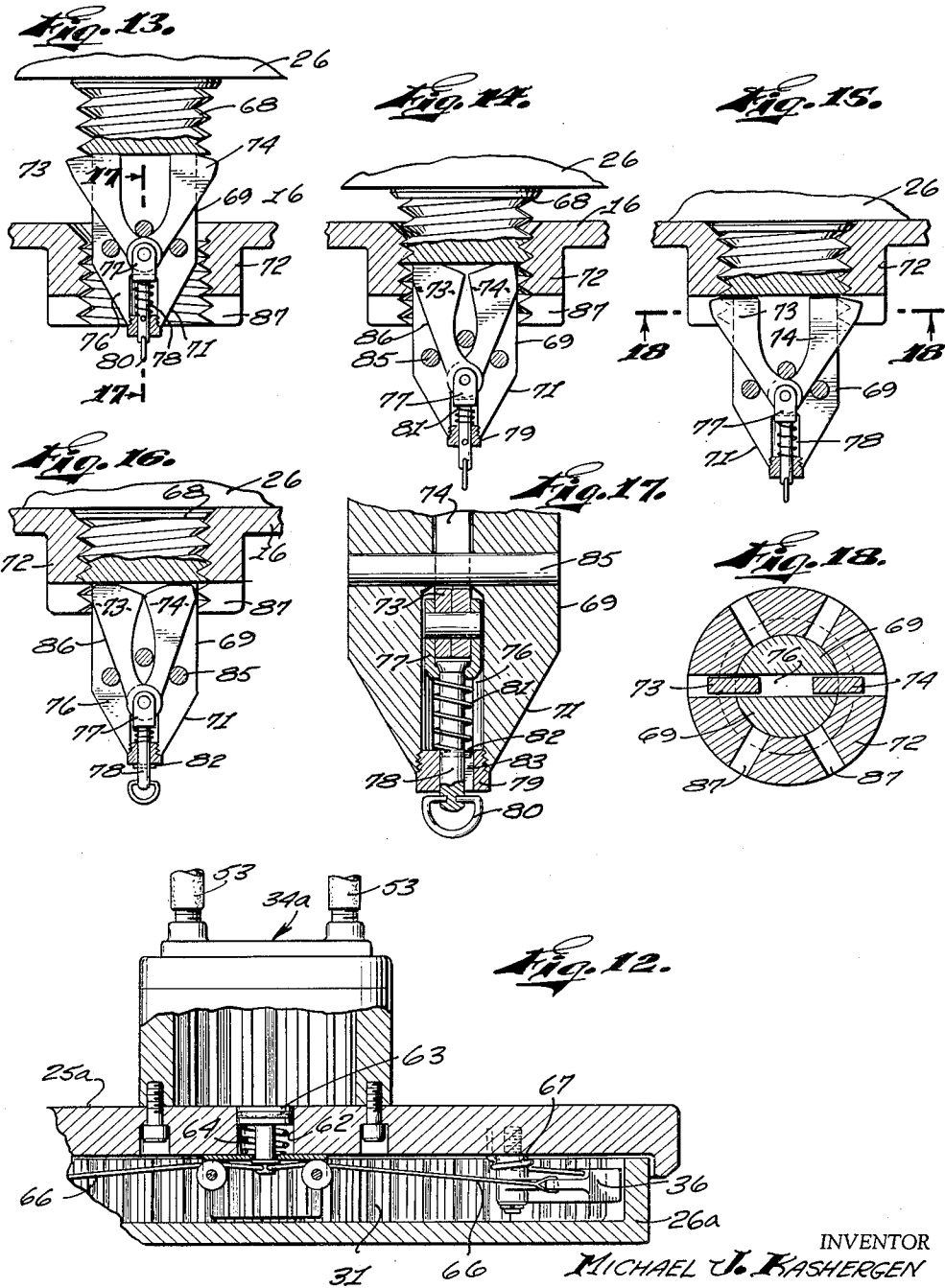
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MULTIPURPOSE APPARATUS FOR EARTHWORKING AND THE LIKE

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5 Sheets-Sheet 4



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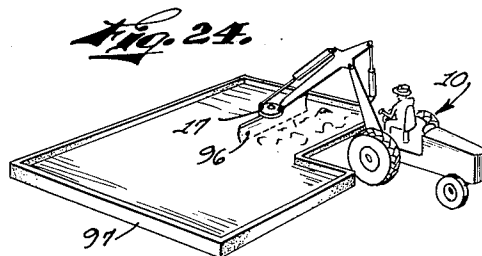
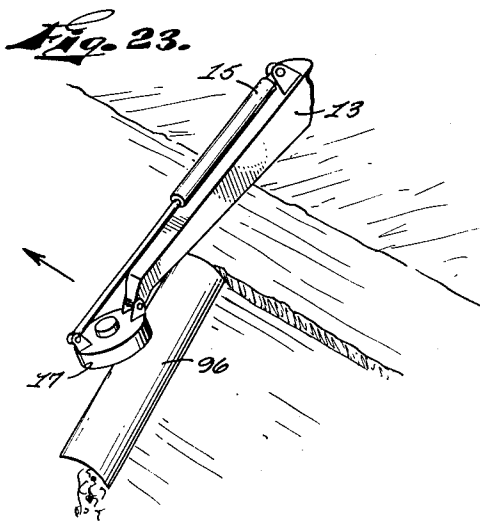
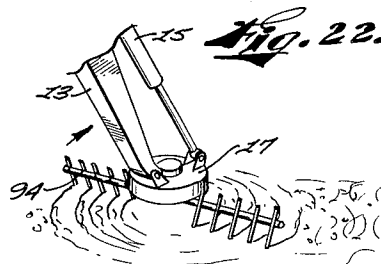
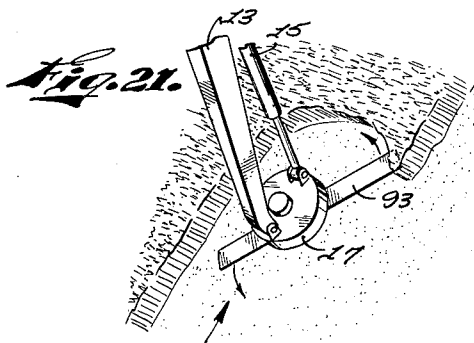
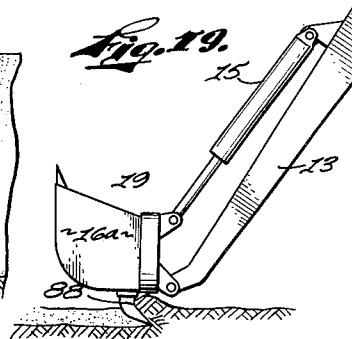
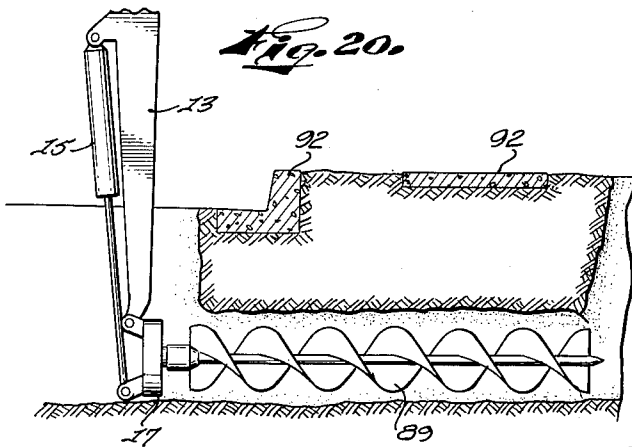
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MULTIPURPOSE APPARATUS FOR EARTHWORKING AND THE LIKE

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5 Sheets-Sheet 5



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3,033,394

MULTIPURPOSE APPARATUS FOR EARTH-WORKING AND THE LIKE

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Filed June 29, 1959, Ser. No. 823,398

12 Claims. (Cl. 214—138)

This invention relates to a multipurpose apparatus for earthworking and the like, adapted to perform all the functions performed by a backhoe and many additional functions. Such additional functions include digging in a variety of ways which cannot be performed by a conventional backhoe, and also include grading, earth boring, harrowing, scarifying, and mowing.

An object of the invention is to provide an apparatus which may be mounted on a conventional backhoe in a few minutes, and which not only increases greatly the operating ability of the backhoe but also permits operation thereof as a grader, earth borer, etc.

A further object of the invention is to provide a backhoe or the like incorporating novel rotation and brake apparatus adapted to effect rotation of the head through any number of revolutions about an axis disposed at the end of the dipper stick, and to effect braking of the head against rotation when none is desired, the rotation and brake apparatus and associate valve means being extremely simple and rugged in construction and necessitating only two additional fluid lines along the boom and dipper stick of the backhoe.

A further object is to provide an extremely rugged rotation and brake means adapted to be mounted at the end of the dipper stick of a backhoe, and operable selectively to effect rotation of the bucket or other attached implement through a number of revolutions and to effect rigid braking of the bucket in any rotated position.

A further object is to provide an attachment for a backhoe or the like, incorporating novel means for coupling the backhoe to various implements without the necessity that the operator leave his seat on the tractor.

A further object is to provide a backhoe apparatus or the like, incorporating novel hydraulic valve and conduit means for effecting alternate rotation and locking of an element.

These and other objects and advantages of the invention will be set forth more fully in the following specification and claims, considered in connection with the attached drawings to which they relate.

In the drawings:

FIGURE 1 is a schematic front elevational view of a backhoe apparatus incorporating the present invention, the boom of the backhoe being illustrated as swung to one side;

FIGURE 2 is a fragmentary section on line 2—2 of FIGURE 1;

FIGURE 3 is a fragmentary longitudinal section taken on line 3—3 of FIGURE 2;

FIGURE 4 is a transverse section taken on line 4—4 of FIGURE 3 and illustrating the interior of the rotation and brake means;

FIGURE 5 is a view corresponding to FIGURE 4 but illustrating the brake means in release position instead of locking position;

FIGURE 6 is a section taken on line 6—6 of FIGURE 3;

FIGURE 7 is a fragmentary section on line 7—7 of FIGURE 4;

FIGURE 8 is a diagrammatic view of the hydraulic

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system, including the control valve, the parts being shown in positions assumed when braking is effected;

FIGURE 9 is a diagrammatic view corresponding generally to FIGURE 8 but illustrating the positions of the parts when rotation is effected in a predetermined direction;

FIGURE 10 is a longitudinal sectional view of the spool of the control valve;

FIGURE 11 is a transverse section of the valve, taken on line 11—11 of FIGURE 8;

FIGURE 12 is a fragmentary schematic view illustrating a different embodiment of the brake means;

FIGURE 13 is a fragmentary sectional view illustrating the quick-connect coupling portion of the apparatus as it is inserted into a cooperating coupling portion of a bucket or other implement;

FIGURE 14 corresponds to FIGURE 13 but illustrates the positions assumed by the parts after partial insertion has been effected;

FIGURE 15 is a view showing the coupling in fully inserted and locked position;

FIGURE 16 illustrates the positions of the parts after the locking elements have been released manually in order that reverse rotation, for uncoupling, may occur;

FIGURE 17 is a fragmentary longitudinal section taken on line 17—17 of FIGURE 13;

FIGURE 18 is a transverse section on line 18—18 of FIGURE 15;

FIGURE 19 is a schematic view illustrating a scarifier means provided on the bucket;

FIGURE 20 is a schematic view illustrating the apparatus when employed as an earth-boring means;

FIGURE 21 illustrates the apparatus when employed as a mowing or cutting means;

FIGURE 22 is a schematic view illustrating the apparatus when employed as a harrowing means;

FIGURE 23 illustrates the apparatus when employed as a grading means to effect grading of an embankment from the upper edge portion thereof; and

FIGURE 24 illustrates the apparatus when employed to finish grade and level the earth enclosed by the forms for a house or the like.

It is a feature of the invention that structure embodying the same may be incorporated on a conventional backhoe or the like in a matter of a few minutes. However, it is to be understood that although the illustrated apparatus will be described as an attachment, it may also be incorporated on the backhoe or the like at the factory as original equipment.

Referring first to FIGURE 1 of the drawings, the apparatus is illustrated as comprising a tractor 10 having a boom 11 mounted thereon in such manner that the operator may effect pivotal movement of the boom about both horizontal and vertical axes. The means for effecting such pivotal movement of the boom 11 is indicated generally and schematically at 12. A dipper stick 13 is pivotally connected to the outer end of boom 11, being adapted to be pivoted about a horizontal axis by the dipper stick cylinder 14. A bucket cylinder 15 is pivotally mounted on the dipper stick 13 and, in a conventional backhoe, is directly connected to the bucket 16. In the present construction, however, the bucket cylinder is not directly connected to the bucket but is instead connected to a combination rotation and brake apparatus 17 adapted to effect rotation of the bucket about an axis generally parallel with or somewhat oblique to the rim 19 of the bucket. The apparatus 17 may sometimes be referred to as a head.

Independently operated outriggers or stabilizer feet 21 and 22 are mounted on tractor 10 to maintain the same stationary, and at the desired level and inclination, during

normal operation of the apparatus. The outriggers 21 and 22, and also the boom actuating means 12 and the cylinders 14 and 15, are operated in a manner known to the art through manipulation of controls represented generally at 23.

Proceeding next to a description of the head or combination rotation and brake apparatus 17, this comprises a generally pancake-shaped casing having a disc-shaped stationary cover 25 and a generally cup-shaped rotating body 26. As shown in FIGURE 3, body 26 has a cylindrical wall which is spaced inwardly from the depending flange or rim of cover 25 in order to provide clearance for rotation of the body relative to the cover as will be described.

Means are provided to pivotally connect the cover 25 at diametrically opposite points to the end of the dipper stick 13 and to the end of the piston rod for bucket cylinder 15. Such means are illustrated at 27 and 28 in FIGURES 2 and 3, and are the same as the conventional means for removably connecting the dipper stick and the bucket cylinder directly to a bucket, so that the apparatus 17 may be incorporated in a conventional backhoe or the like in a matter of minutes.

A strong central shaft or spindle 29 is keyed into the strengthened central or hub portion of body 26, as shown in FIGURE 3, and has its upper end rotatably mounted in a hub portion at the center of cover means 25 by means of double-thrust roller bearing means 30. It follows that when the body 26 is turned, the spindle 29 will also turn in the bearing means 30. The outer or lower portion of the spindle 29 forms part of a quick-connect coupling to be described subsequently in connection with FIGURES 13—18.

Means are provided to effect rotation of the body 26 and thus spindle 29, about the axis of the spindle, and comprise a large-diameter internal spur gear 31 which may be rigidly secured to or formed integral and concentric with the inner portion of the cylindrical side wall of body 26. The gear 31 is driven by a pinion 32 which meshes therewith at all times and which, in turn, is fixedly mounted on the shaft 33 (FIGURES 4—6) of a reversible hydraulic motor 34. Motor 34 is fixedly mounted on cover 25, at such position that its shaft 33 may extend parallel to spindle 29 for keying to the spur gear 32. In order to shorten the apparatus, the lower end wall of motor 34 and the cover 25 may be made integral with each other.

The brake portion of the head or combination rotation and brake apparatus 17 includes two dogs or pawls 36 which are pivotally mounted in the casing on short shafts 37 (FIGURE 7), such shafts being anchored in the cover 25 and extending parallel to spindle 29. The dogs are shifted between their locking (FIGURE 4) and release (FIGURE 5) positions by means of cylinders 38 containing springs 39 (FIGURES 8 and 9) adapted to bias the dogs toward the locking positions. Upon introduction of hydraulic fluid into the cylinders, the bias of springs 39 is overcome and the dogs are pivoted to release positions.

Referring to FIGURES 8—11, there will next be described the hydraulic system for alternately effecting rotation and locking of the casing body 26 and attached bucket or other implement. The hydraulic system includes a very important four-way open-center spool valve 42 adapted to be connected into the hydraulic circuit already present on the tractor 10. It is to be understood that conventional tractor apparatus of the type indicated incorporates a fluid pump 43 adapted to pump fluid through the previously-indicated controls 23 and thence to the sump 44. Operation of the controls 23 effects flow of a substantial portion of the fluid from pump 43 to such apparatus as the boom cylinder 14, bucket cylinder 15, etc. To interpose the present valve 42 into the existing hydraulic circuit, in series relationship, it is merely necessary to connect one port 46 of the valve to pump 43

and another port 47 to the existing controls 23. A third port 48 of the valve is then connected to the line 49 between the controls 23 and sump 44.

Additional ports 51 and 52 of valve 42 are connected, respectively, through lines or hoses 53 and 54 to the reversible hydraulic motor 34. Furthermore, lines 56 are employed to effect communication between the interior of motor 34 and both of the brake cylinders 38. It is to be understood that the lines 56 may be entirely within the casing formed by cover 25 and body 26, so that only the lines 53 and 54 need be extended along the boom and dipper stick.

The spool portion of valve 42 is formed with four axially-spaced annular grooves 57—60, such grooves being separated by lands. Furthermore, the previously-indicated port 48 of the valve comprises a sliding tube which communicates with an axial passage 61 in the spool and thus through suitable side passages 61a and 61b with both of the grooves 57 and 60.

The spacing of the annular grooves 57—60, and the construction of the ports through the valve casing, are such that when the spool is in a central position (FIGURE 8), the pump 43 will merely effect flow of fluid straight through the valve 42 to the other controls 23 and sump 44, there being no fluid flow through lines 53 and 54 to motor 34. However, it is an important feature of the invention that when the valve is in this position both of the lines 53 and 54 are drained or bled to the sump 44, in order to relieve the fluid pressure in brake cylinders 38 and permit springs 39 to return the dogs 36 to the illustrated locking positions. The drain or bleed path from line 53 is through valve port 51, annular groove 57, passage 61a, passage 61, and port 48 to sump 44. The bleed path from line 54 is through port 52, annular groove 60, passage 61b, passage 61, and port 48 to the sump 44. It is pointed out that the ports 51 and 52 are elongated or oval-shaped immediately adjacent the spool, to effect the above-indicated communication with the grooves 57 and 60 when the valve is in the FIGURE 8 position.

To effect operation of the motor 34 in a predetermined direction, such as clockwise as viewed in FIGURE 9, the spool of valve 42 is shifted downwardly to the position shown in FIGURE 9. A flow path is then completed from motor 43 to port 46, annular groove 59, port 52, line 54, hydraulic motor 34, line 53, valve port 51, annular groove 57, port 47, controls 23, and line 49 to sump 44. To effect rotation of motor 34 in the opposite direction, the spool is merely shifted to its extreme upward position to create a corresponding but oppositely-directed flow through lines 53 and 54. It is pointed out that regardless of the position of the spool, there is always flow of fluid to the other controls 23 so that these controls remain operative to permit functioning of the associated cylinders and the like. Some flow always occurs through port 48 to the sump, but this is small since passage 61 is restricted in diameter. It has been discovered that despite the relatively small size of passages 61, 61a and 61b, the drainage of fluid from cylinders 38 is sufficiently rapid, after shifting of the spool from the FIGURE 9 position back to the FIGURE 8 position, that the dogs 36 will assume braking positions substantially immediately after the motor 34 ceases to operate.

Referring next to FIGURE 12, a second embodiment of the brake apparatus is illustrated, in which the cylinders 38 and lines 56 are eliminated. In this embodiment, the cover of the casing and one end plate of the hydraulic motor 34a are illustrated as being formed of the same integral piece of metal, being numbered 25a. A cylindrical bore 62 is provided in element 25a and communicates with the interior of motor 34a. A piston 63 is mounted in bore 62 and is biased by a spring 64 to a position relatively adjacent the motor except when fluid under pressure is present in the motor. The piston rod of the piston 63

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is associated with a cable 66 adapted upon downward shifting of the piston to pull both of the dogs 36 away from the gear 31 and thus release the brake. Suitable springs 67 are associated with the dogs to maintain them in locking positions at all times when the fluid pressure in the motor 34 is relieved due to bleeding of lines 53 and 54 as described above in connection with FIGURE 8.

Proceeding next to a description of the quick-connect coupling means, and referring particularly to FIGURES 13-18 as well as FIGURES 3 and 6, this comprises an externally-threaded element 68 formed axially and preferably integrally with the spindle 29. A cylindrical portion 69, of smaller diameter than threaded element 68, is provided axially therebeneath and terminates at its lower end in a conical portion 71. Each bucket 16 or other implement is formed with an internally-threaded socket portion 72 adapted to receive threaded element 68. It is pointed out that when the bucket or other implement is merely resting on the ground, detached from the present apparatus, the operator may by appropriate manipulation of controls 23 cause the conical portion 71 to enter socket 72 and then effect guiding of cylindrical portion 69 therein. This continues until the threaded element 68 is adjacent the threads of socket 72, at which time the operator effects rotation of the body 26 and thus threaded element 68 in a direction adapted to effect threading and insertion of element 68 into socket 72.

Automatic cam and latch means are provided to effect locking, after the above-described insertion, of the bucket or other implement against rotation relative to the spindle and its threaded portion 68. Such means comprise first and second upwardly-diverging cam and latch elements 73 and 74 which are disposed in a space or gap 76 between opposed portions of the cylindrical and conical parts 69 and 71, such parts being bifurcated as illustrated. The lower ends of elements 73 and 74 are pivotally connected to a U-shaped element 77 disposed in gap 76, and such element is rotatably connected to a pin 78 which extends downwardly and slidably through a plug 79 to a handle 80. A helical compression spring 81 is seated between the plug 79 and the U-shaped element 77 to maintain the latter in the uppermost position permitted by a detent member 82 associated with the pin. Member 82 is vertically movable in a groove slot 83 in plug 79 when it is aligned therewith. However, in order to lock the U-shaped element 77 in its lowermost position, it is merely necessary to pull downwardly on handle 80 until the detent 82 passes beneath the lower end of groove 83, at which time the handle (and thus pin 78) is rotated and released to effect seating of the detent 82 on the lower surface of plug 79 as shown in FIGURE 16. Suitable pins 85 are mounted transversely in cylindrical portion 69 on opposite sides of cam and latch elements 73 and 74 to limit the movements thereof.

The cam and latch elements 73 and 74 are so shaped that they will be nested completely in the gap or space 76 when the handle 80 and pin 78 have been shifted downwardly to the FIGURE 16 position, as described above, and maintained at such position through operation of the detent member 82. Such a nested condition of the latch elements 73 and 74 is also achieved automatically through operation of cam surfaces 86 when the cylindrical element 69 is inserted into socket 72 from the FIGURE 13 position to the FIGURE 14 position, the rim of socket 72 being beveled to form a cam-actuator means. The latch elements then snap outwardly to the FIGURE 15 position (detent 82 then being in line with groove 83) as soon as the upper ends of the latch elements come into registry with a plurality of radial slots 87 which are formed in the lower end of socket member 72 as best shown in FIGURE 18. Thus, the latch and cam elements 73 and 74 enter the slots 87 to prevent rotation of elements 26, 68, 69 and 71 relative to elements 16 and 72.

In summary, when the operator desires to insert the

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threaded spindle portion 68 into the socket 72 of a particular implement, and assuming that detent 82 is in line with groove 83, he manipulates controls 23 (as previously stated) to effect automatic insertion, threading and locking. To detach the head from a bucket 16 or other implement, the operator leaves his seat and pulls on the handle 80 to effect nesting of elements 73 and 74 in space 76 as shown in FIGURE 16, following which he turns the handle 80 to effect locking of the cam and latch elements in such position despite the bias of spring 81. He then assumes his seat on the apparatus, and effects operation of the controls 23 to rotate the head portion 26 in a direction effecting unthreading of element 68 relative to socket 72.

Referring next to FIGURES 19-24, inclusive, there are illustrated a number of attachments which may be associated with the head 17 in addition to or in place of the bucket 16. FIGURE 19 shows a bucket 16a having a scarifier tooth 88 mounted on the bottom thereof (opposite rim 19). The tooth 88 is particularly useful in scarifying hard surfaces which resist attack by the teeth on the lip of the bucket. It is pointed out that, because of the ability of the operator to rotate the bucket 16a, he may readily effect scarifying by means of tooth 88 and then effect removal of the loosened earth by means of the bucket.

Referring next to FIGURE 20, the screw auger 89 is illustrated as mounted on the head 17 axially of the spindle 29. Auger 89, and also all of the other implements referred to herein, are provided with socket elements corresponding to the illustrated socket 72 on bucket 16 in order that the previously-described quick-connect coupling may be employed. Auger 89 is adapted not only to dig post holes and the like, but also to drill at an angle or horizontally beneath the surface of the earth as shown in FIGURE 20. FIGURE 20 illustrates an operation in which the auger is employed to bore a hole for a sewer pipe beneath a sidewalk indicated at 91, the curb of the road being indicated at 92. During this operation, the tractor 10 may be positioned either on the sidewalk or out in the street.

In FIGURE 21, a mowing or cutting blade 93 is illustrated as mounted on the head 17 perpendicular to the spindle. This blade 93 may be employed to cut grass, etc., growing on a steep bank, the tractor then being positioned on level ground adjacent the rim of the bank.

FIGURE 22 illustrates a spike-tooth harrow 94 adapted to perform functions such as removing dead ice plant, preparing ground for seeding, etc.

FIGURE 23 illustrates a grader blade 96 mounted on head 17 and in position to effect grading of the upper portion of a bank or slope by means of a tractor disposed on the horizontal ground adjacent the rim of the bank or slope. It is pointed out that FIGURES 21-23 illustrate functions which are particularly useful relative to the planted banks or slopes adjacent many freeways or expressways.

FIGURE 24 illustrates the operation of the apparatus (with the blade 96) for effecting finish grading or leveling, for example within the rough forms 97 for a house or the like. Such finish grading or leveling can be accomplished with extreme accuracy, preparatory to the laying of a concrete slab or the like, by the following method. The operator first swings the boom to one side position and then operates one of the outriggers or stabilizer feet 21 (FIGURE 1) until the lower edge of blade 96 is resting on one portion of the form 97 or other form. The operator then swings the boom to the other side and effects operation of the other stabilizer or outrigger means 22 until the lower edge of the grader blade is resting on another portion of the form spaced a substantial distance from the first-mentioned portion. Assuming that the head 17 has been operated to turn the blade 96 to the proper position generally radial to the vertical axis of the boom at tractor 10, it is then merely

necessary to swing the boom and effect perfect leveling of the material between the indicated spaced portions of the form. This operation is then repeated at adjacent portions of the area to be leveled, through appropriate manipulation of the tractor, head, boom and dipper stick, until the entire region enclosed by the forms has been finish leveled and graded.

Various embodiments of the present invention, in addition to what has been illustrated and described in detail, may be employed without departing from the scope of the accompanying claims.

I claim:

1. A combination rotating and braking head attachment for mounting on the end of the dipper stick of a backhoe or the like, said backhoe having a bucket cylinder pivotally mounted on said dipper stick, a stationary element, means to pivotally connect said stationary element to said dipper stick for rotation about a generally horizontal axis, means to pivotally connect said stationary element to said bucket cylinder whereby operation of said bucket cylinder effects said pivotal movement of said stationary element about said horizontal axis, a rotatable element rotatably mounted on said stationary element for rotational movement about an axis transverse to said horizontal axis, rotary fluid motor means provided on said stationary element to effect said rotational movement of said rotatable element, fluid-operated brake means additional to said motor means to lock said rotatable element against rotation, two and only two fluid conduits to connect both said motor and said brake means to control means disposed on the tractor portion of the backhoe, and fluid control means disposed on said tractor portion and connected to said two conduits to effect alternate operation of said motor means for rotation of said rotatable element and of said brake means for locking of said rotatable element and in response to pressure in and flow of fluid through said two conduits only.

2. The invention as claimed in claim 1, in which said brake means includes a spring-operated element biased toward braking position to maintain said rotatable element locked, and means responsive to the presence of operating or running pressure in said fluid motor means to effect shifting of said brake element to unlocking position and permit rotation of said rotatable element, and in which said control means includes valve means to first effect flow of fluid under pressure through said two conduits for operation of said motor and release of said brake element and thereafter effect bleeding of said fluid from said conduits to permit said spring-operated element to assume braking position and prevent rotation of said rotatable element.

3. The invention as claimed in claim 2, in which said motor is a reversible motor, and in which said valve means includes means to effect flow of fluid in opposite directions through said conduits to thereby effect operation of said motor in opposite directions.

4. A combination rotating and braking head for mounting on the dipper stick of a backhoe or the like, which comprises a casing having a cover and a body, bearing means to rotatably associate said body with said cover to permit rotational movement of said body relative to said cover, said bearing means including a central spindle and associated bearing, an internal gear rigidly associated with the internal wall of said body and concentric with said spindle, a pinion disposed in said casing and meshed with said internal gear, a hydraulic motor mounted on said cover and connected to said pinion to effect rotation thereof, means to pivotally connect said cover to the dipper stick and bucket cylinder of a backhoe or the like, means to removably secure said body to a bucket or the like, a brake element movably mounted on said cover within said casing and adjacent said internal gear, means to urge said brake element toward a braking position in engagement between adjacent teeth of said internal gear to lock the same against rotation, and means responsive

to the presence of hydraulic fluid under motor-operating pressure within said hydraulic motor to effect shifting of said brake element away from said internal gear to permit rotation thereof.

5. A combination rotating and braking head for mounting on the dipper stick of a backhoe or the like, which comprises a casing having a cover and a body, bearing means to rotatably associate said body with said cover to permit rotational movement of said body relative to said cover through any number of revolutions, an internal gear rigidly associated with the internal wall of said body and concentric with the axis of rotation thereof, a pinion meshed with said internal gear, a motor mounted on said cover and connected to said pinion to effect rotation thereof, means to pivotally connect said cover to the dipper stick and bucket cylinder of a backhoe or the like, a quick-connect coupler adapted to effect connection of said body to an implement in response to rotation of said body relative to said cover, and means to effect locking of said quick-connect coupler relative to the attached implement after coupling has been achieved.

6. A combination rotation and brake apparatus for attachment to the dipper stick of a backhoe or the like, said backhoe having a hydraulic circuit including a hydraulic pump and hydraulic control means to selectively direct fluid from said pump to various cylinder and other components of the backhoe, which comprises a stationary element adapted to be pivotally attached to the dipper stick and bucket cylinder of the backhoe, a rotating element rotatably mounted on said stationary element, a rotary hydraulic motor to effect rotation of said rotating element relative to said stationary element, a brake element biased toward a braking position at which rotation of said rotating element relative to said stationary element is prevented, means responsive to the presence of hydraulic fluid under operating pressure in said motor to shift said brake element to a release position permitting rotation of said rotating element relative to said stationary element, first and second hoses connected to said motor, and valve means connected to said hoses remote from said motor and adapted to be connected in said hydraulic circuit of the backhoe, said valve means being adapted selectively to circulate hydraulic fluid through said hoses for operation of said hydraulic motor and to effect bleeding of at least one of said hoses to relieve the pressure in said motor and permit return of said brake element to braking position, said valve means being adapted to permit circulation of fluid in said hydraulic circuit from said pump through said control means of the backhoe regardless of the position of said valve means whereby said control means of the backhoe may be employed to operate said other components of the backhoe.

7. A multipurpose earthworking apparatus, which comprises a movable support, a boom pivotally connected to said movable support, a rotatable element rotatably mounted on said boom remote from said movable support, control and actuating means operable by an operator on said movable support to effect positioning of said boom until said rotatable element is in a predetermined position and also to effect alternate rotation and braking of said rotatable element, a plurality of different earthworking implements, and quick-connect coupler means mounted on said rotatable element and on said implements and operable by said operator while on said movable support to effect selective coupling of said rotatable element to any one of said implements, said quick-connect coupler means comprising threaded means adapted in response to rotation of said rotatable element to be threadedly inserted into any one of said implements, and means to automatically lock said threaded means against rotation relative to said implement after insertion therein.

8. The invention as claimed in claim 7, in which said lock means comprises cam and latch means mounted on

said rotatable element, means to normally bias said cam and latch means to locking position, cam-actuator means provided on each of said implements to shift said cam and latch means against said bias to a release position during threading of said threaded means into each implement, and means on each one of said implements to permit shifting of said cam and latch means to locking position in response to said bias and after insertion of said threaded means therein.

9. The invention as claimed in claim 8, in which manually-operable means are provided to maintain said cam and latch means in release position in order to permit unthreading of said threaded means relative to the attached implement for disconnection therefrom.

10. Apparatus in the nature of a backhoe, which comprises a tractor having a hydraulic circuit, first and second stabilizer or outrigger feet mounted on said tractor for engagement with the earth therebeneath to lock said tractor in a predetermined position and at a predetermined level, a boom pivotally connected to said tractor for pivotal movement about both vertical and horizontal axes, means to pivot said boom about said vertical and horizontal axes under the control of an operator, a dipper stick pivotally connected to the outer end of said boom, means to pivot said dipper stick relative to said boom and in a generally vertical plane, casing means including a stationary cover and a rotating body, bearing means to rotatably support said body on said cover, a bucket cylinder pivotally connected between said dipper stick and said cover, means to pivotally connect said stationary cover to said dipper stick, a rotary hydraulic motor mounted on said cover, an internal gear fixedly mounted in said rotating body coaxially of the axis of rotation permitted by said bearing means, a pinion mounted in said casing and meshed with said internal gear, means to effect rotation of said pinion by said hydraulic motor to thereby rotate said rotating body relative to said cover, brake means mounted in said casing and connected to said cover, spring means to normally effect engagement of said brake means with said internal gear to lock said rotating body against rotation relative to said cover, hydraulic means responsive to the presence of operating pressure in said motor to effect release of said brake means whereby said body may rotate relative to said

cover, first and second hoses connected to said motor and extending along said dipper stick and boom to said tractor, control means connected in the hydraulic circuit of said tractor and operable to effect flow of hydraulic fluid from said circuit through said hoses to said motor and to drain hydraulic fluid from said hoses for relief of the pressure in said motor and consequent braking operation of said brake means, and means to effect removable connection of said rotating body to any one of a plurality of implements including a bucket and a grader blade.

11. The invention as claimed in claim 10, in which said last-named means comprises quick-connect coupler means having an externally-threaded element coaxial with the axis of rotation of said body relative to said cover, cooperating internally-threaded means provided on each of said implements, means to guide said threaded element into said threaded means in response to rotation of said body relative to said cover by said motor and under the control of an operator on said tractor, and means to automatically effect locking of said threaded means relative to said threaded element after insertion of said threaded element therein.

12. The invention as claimed in claim 10, in which said hydraulic means includes a cylindrical bore formed in said cover and communicating directly with the interior of said motor, a piston slidably mounted in said bore, and means to connect said piston to said brake means.

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