

[54] **MOUNTING ASSEMBLY FOR ATTACHING
A MATERIAL TREATING BLADE TO A
VEHICLE**

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[51] Int. Cl. **E02f 3/76**

[58] Field of Search 172/801, 803, 804, 805,
172/807, 809, 276, 776; 37/42 R

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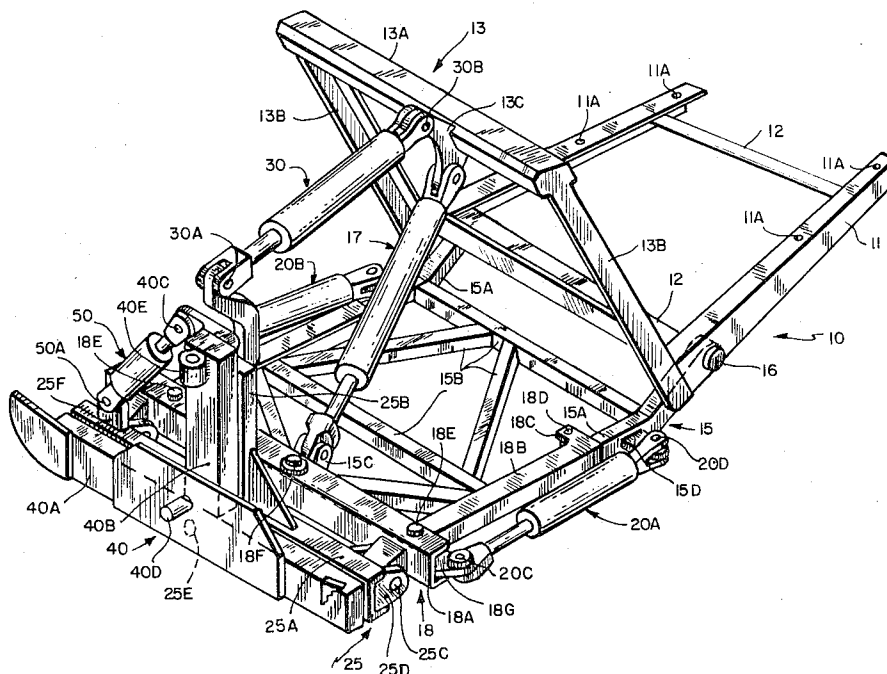
Primary Examiner—Stephen C. Pellegrino

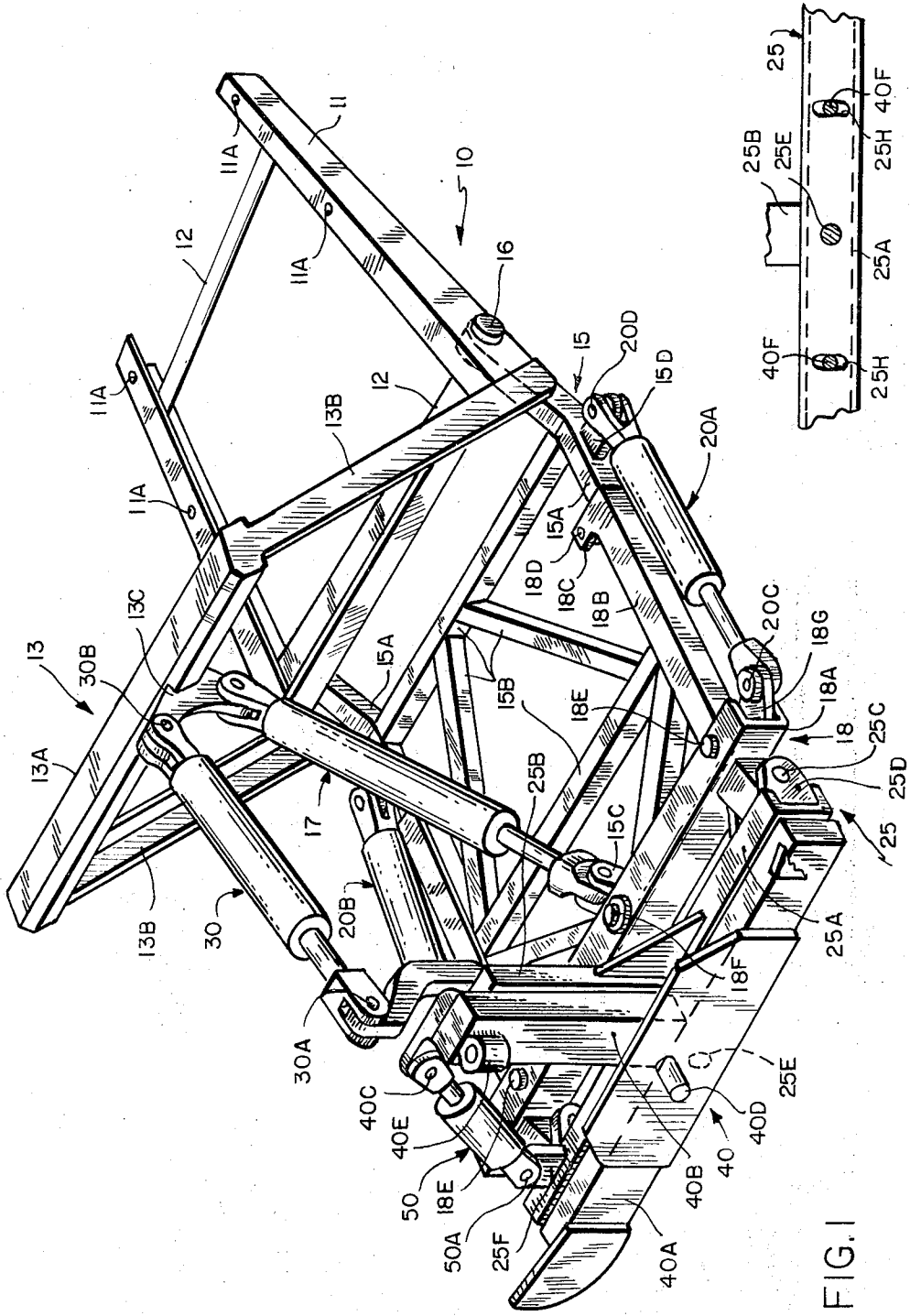
[57] **ABSTRACT**

A mounting assembly for attaching a material treating blade to a vehicle such as a tractor which provides a material treating blade which is adjustable in height and the cutting angle of which is adjustable in three planes so that it is better adapted to grading, shaping and plowing soil and snow surfaces and to developing desired grades in movable matter. The assembly comprises first frame means for attachment to a vehicle, second frame means extending forwardly from the first frame means, first pivot means for securing one

end of the second frame means to the first frame means for movement about an axis which is substantially horizontal and substantially normal to the longitudinal centerline of the second frame means when viewed from the top, first double acting hydraulic motor means pivotally connected between the first and second frame means for moving the second frame means about the first pivot means, third frame means adjacent to the forward end of the second frame means, second pivot means for securing the third frame means to the second frame means for movement about an axis which is substantially vertical and substantially normal to the longitudinal centerline of the second frame means when viewed from the side, second double acting hydraulic motor means pivotally connected between the second and third frame means for moving the third frame means about the second pivot means, fourth frame means adjacent to the forward end of the third frame means, third pivot means for securing the fourth frame means to the third frame means for movement about an axis which is substantially horizontal and substantially normal to the longitudinal centerline of the third frame means when viewed from the top, third double acting hydraulic motor means pivotally connected between the first and fourth frame means for moving the fourth frame means about the third pivot means, fifth frame means adjacent to the forward end of the fourth frame means which is adapted to support a material treating blade, fourth pivot means for securing the fifth frame means to the fourth frame means for movement about an axis which is substantially horizontal and fourth double acting hydraulic motor means pivotally connected between the fourth and fifth frame means for moving the fifth frame means about the fourth pivot means.

8 Claims, 10 Drawing Figures





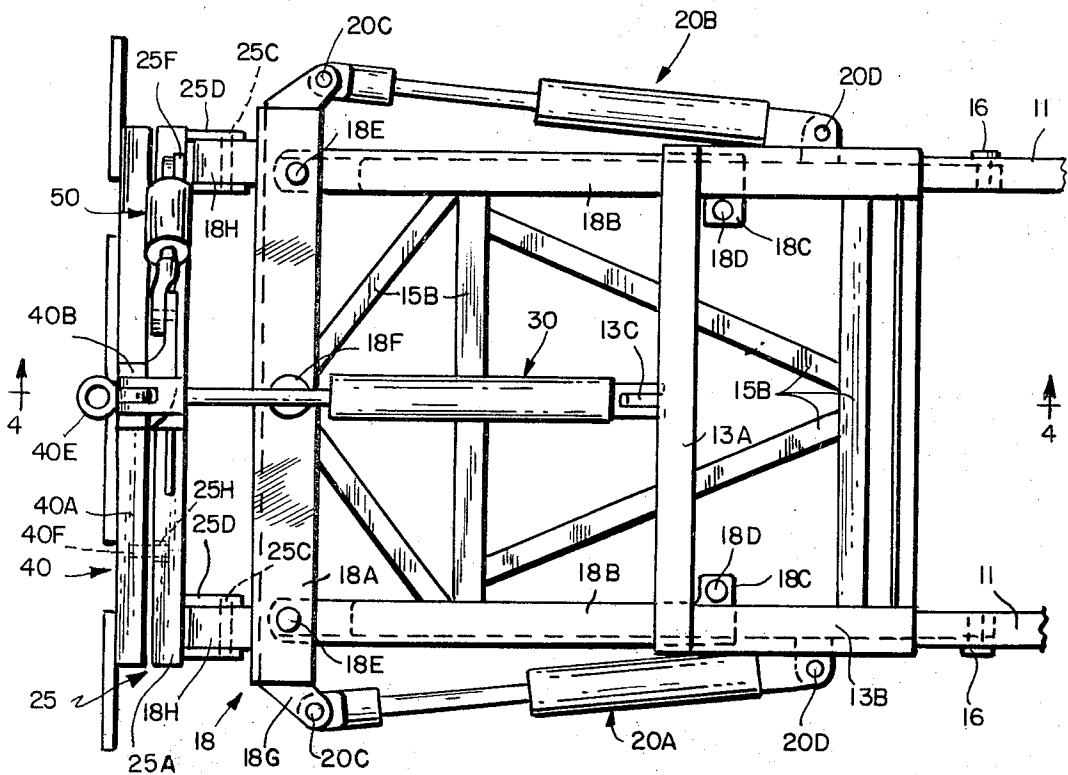


FIG. 2

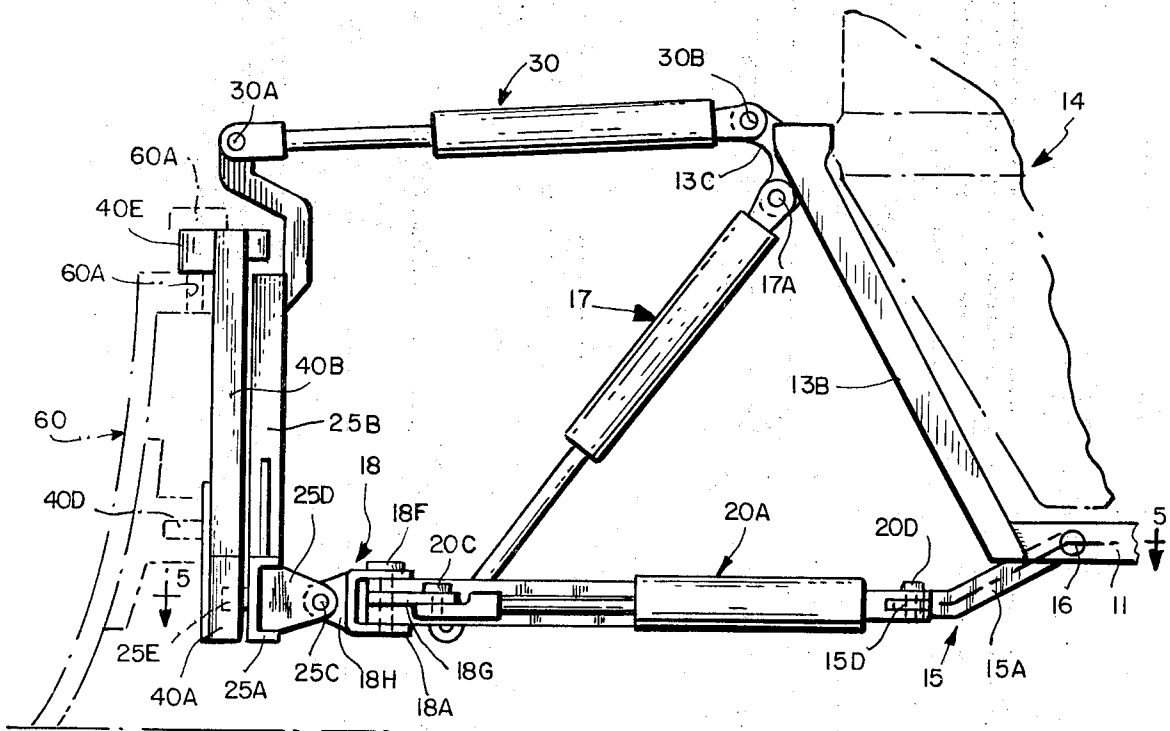


FIG. 3

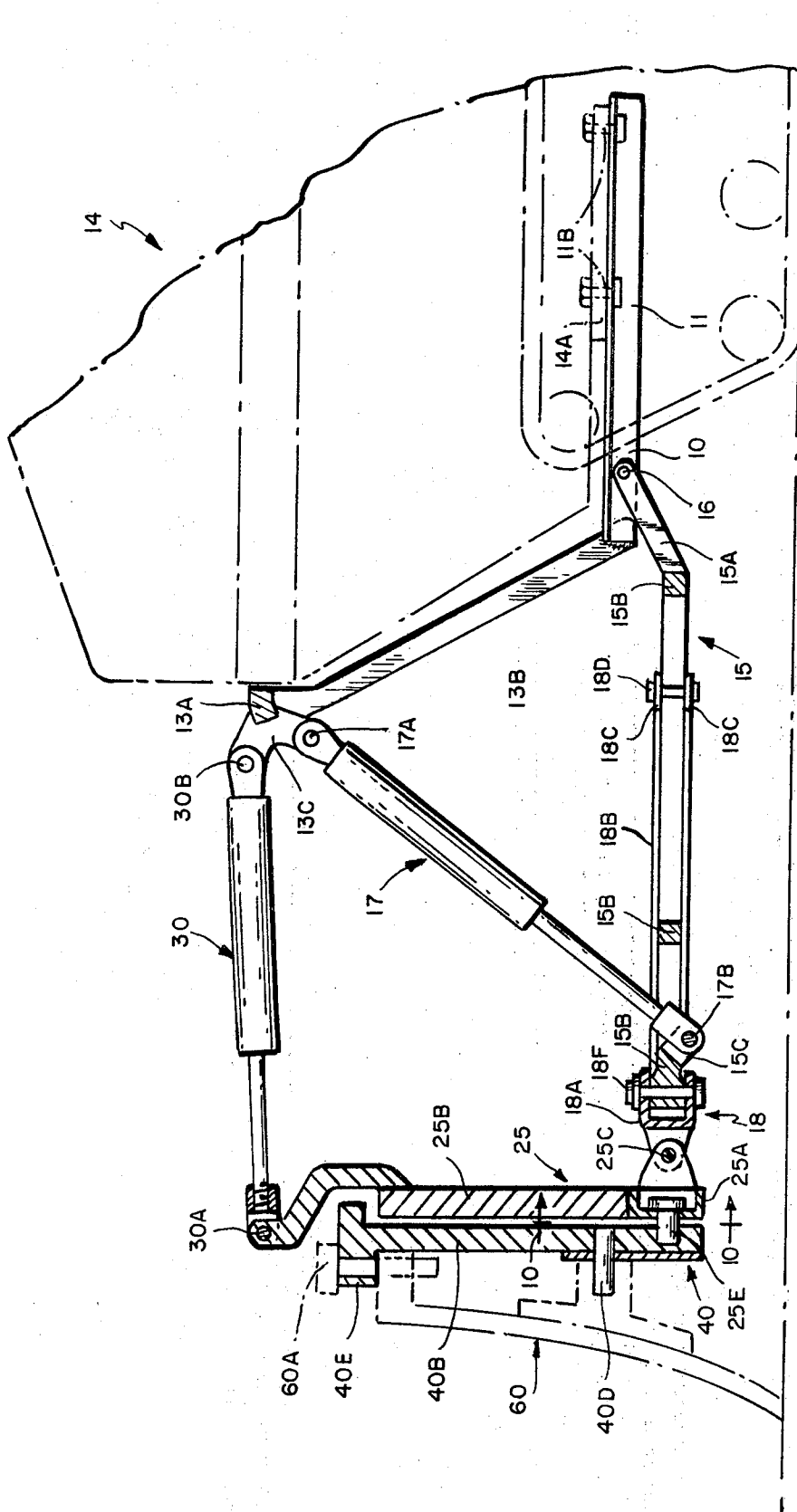


FIG. 4

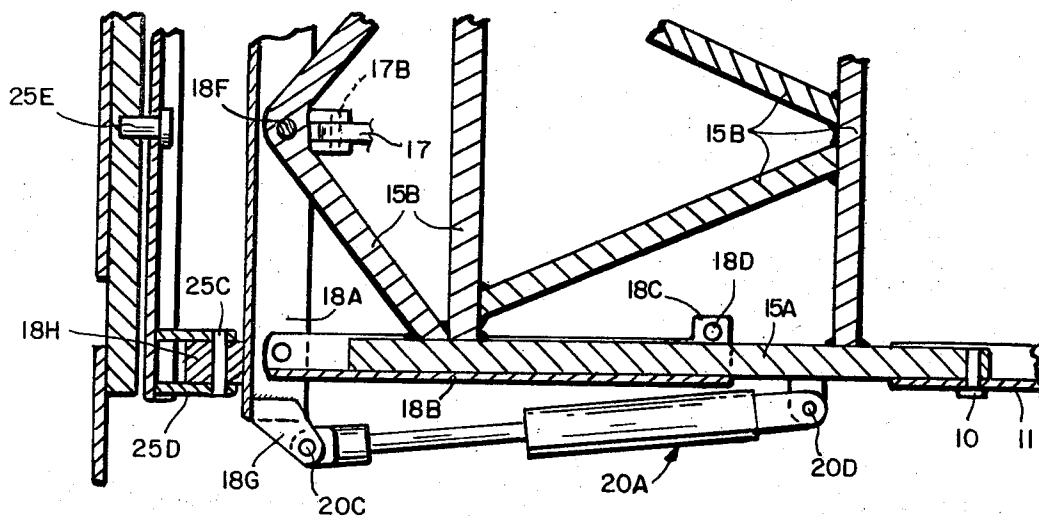


FIG. 5

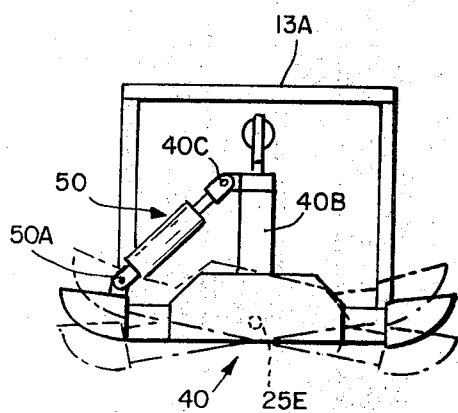


FIG. 6

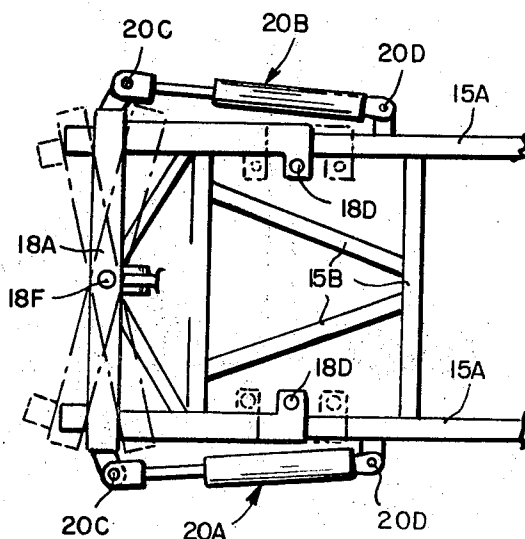


FIG. 7

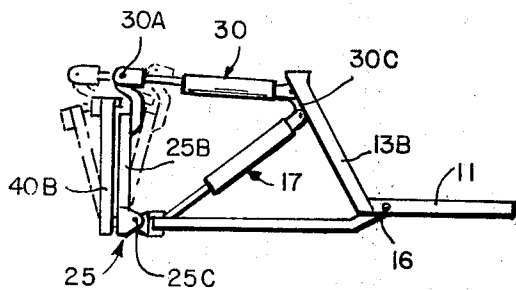


FIG. 8

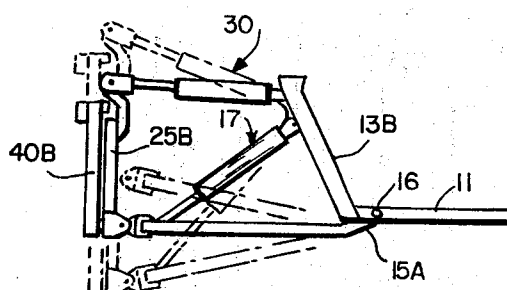


FIG. 9

MOUNTING ASSEMBLY FOR ATTACHING A MATERIAL TREATING BLADE TO A VEHICLE

BACKGROUND OF THE INVENTION

This invention relates to a mounting assembly for a material treating blade for attachment to a tractor, all terrain vehicle, snow grooming vehicle or the like. The material treating blade may be a snowplow blade, a scraper blade or other blade which requires adjustment in the cutting angle or angle of attack of the material treating blade.

While attempts have been made to provide such an apparatus in which such a material treating blade is adjustable in height and in which the cutting angle is adjustable in two planes, so far as I know, such an apparatus has not been provided in which the blade is adjustable in height and in which the cutting angle of the blade is adjustable in three planes. In addition, so far as I know, such an apparatus has not been provided in which a plurality of double acting hydraulic motor means are used which permits the operator of the vehicle to which the mounting assembly is attached to make all of the adjustments from a readily accessible hydraulic control valve or valves for changing the height and for correcting the angles.

One object of this invention is to provide a new and improved mounting assembly for attaching a material treating blade to a vehicle.

Another object is to provide such an assembly in which the material treating blade is adjustable in height and in which the cutting angle of the blade is adjustable in three planes.

A further object is to provide such an apparatus which includes four double acting hydraulic motor means which permits the operator of the vehicle easily to make the height adjustment and the adjustments of the cutting angles of the blade easily from a readily accessible control or readily accessible controls which selectively controls or control the hydraulic motor means.

Yet another object is to provide such an apparatus in which the adjustability of all angles of attack allows reduction of the power required from the vehicle because the most desirable shear angle and height of the blade can be maintained under varying material resistance characteristics.

A still further object is to provide such an apparatus which is economical to manufacture and which may be easily serviced.

Other objects and advantages of the invention will be apparent to persons skilled in the art from the following description taken in conjunction with the accompanying drawings.

SUMMARY OF THE INVENTION

According to the present invention, the apparatus consists of a mounting assembly for attaching a material treating blade to a vehicle.

A first frame member is provided which includes a pair of longitudinally extending arms for attachment to the forward portion of a vehicle such as a tractor, all terrain vehicle, snow grooming vehicle or the like.

Second frame means is provided which extends forwardly from the forward end of the first frame means.

First pivot means is provided for pivotally connecting the rearward end of the second frame means to the first frame means for movement of the second frame means about the axis of the first pivot means which is substantially horizontal and substantially normal to the longitudinal centerline of the second frame means when viewed from the top.

First double acting hydraulic motor means is provided and it is pivotally connected between the first and second frame means for moving the second frame means about the first pivot means.

Third frame means is provided adjacent to the forward end of the second frame means and second pivot means is provided for pivotally connecting the third frame means to the second frame means for movement about an axis which is substantially vertical and substantially normal to the longitudinal centerline of the second frame means when viewed from the side.

Second double acting hydraulic motor means is provided and it is pivotally connected between the second and third frame means for moving the third frame means about the second pivot means.

Fourth frame means is provided adjacent to the forward end of the third frame means and third pivot means is provided for pivotally connecting the fourth frame means to the third frame means for movement about an axis which is substantially horizontal and substantially normal to the longitudinal centerline of the third frame means when viewed from the top.

Third double acting hydraulic motor means is provided and it is pivotally connected between the first and fourth frame means for moving the fourth frame means about the third pivot means. Preferably the longitudinal centerline of this third frame means is substantially parallel to the second frame means when the apparatus is viewed from the side.

Fifth frame means is provided adjacent to the forward end of the fourth frame means and it includes means adapted to support a material treating blade.

Fourth pivot means is provided for pivotally connecting the fifth frame means to the fourth frame means for movement about an axis which is substantially horizontal, substantially at the centerline of the mounting assembly when viewed from the top and substantially midway between the ends of said fifth frame means.

And, fourth double acting hydraulic motor means is pivotally connected between the fourth and fifth frame means for moving the fifth frame means about the fourth pivot means.

In a preferred embodiment, the fourth frame means includes a pair of arcuate slots, one at either side of the fourth pivot means, and the fifth frame means includes a pair of spaced members extending into these slots.

In another preferred embodiment, the second frame means includes a pair of laterally spaced side members which are substantially parallel to the longitudinal centerline of the second frame means, the third frame means includes a pair of rearwardly extending spaced guide members which slidably engage said laterally spaced side members and a pair of fifth pivot means are provided for pivotally connecting the forward ends of the spaced guide members to a forward element of the third frame means for movement about axes which are substantially vertical.

In yet another preferred embodiment, the first frame means includes a first upwardly extending member and one end of the first double acting hydraulic motor

means is pivotally connected to an elevated portion of this first upwardly extending member.

In a still further preferred embodiment, the first frame means includes a first upwardly extending member and one end of the third double acting hydraulic motor means is pivotally connected to an elevated portion of the first upwardly extending member and the fourth frame means includes a second upwardly extending member and the other end of the third double acting hydraulic motor means is pivotally connected to an elevated portion of the second upwardly extending member.

In another embodiment, the fifth frame means includes a third upwardly extending member intermediate its ends, one end of the fourth double acting hydraulic motor means is pivotally connected to an elevated portion of this third upwardly extending member and the other end of the fourth double acting hydraulic motor means is pivotally connected to an end portion of the fourth frame means.

In a further embodiment, the second double acting hydraulic motor means includes a pair of double acting hydraulic motor means, one located adjacent to one side of the second frame means and the other located adjacent to the opposite side of the second frame means when the assembly is viewed from the top.

Preferably, all of the double acting hydraulic motor means are connected to an hydraulic system of the vehicle by conduits. These conduits lead to a control valve or control valves so that the operator of the vehicle is able easily to control the reciprocating actions of the rams in the cylinders of the respective double acting hydraulic motor means.

This invention provides a material treating blade which is adjustable in height and the cutting angle of which is adjustable in three planes so that it is better adapted to grading, shaping and plowing soil and snow surfaces and to developing desired grades in movable matter.

Providing adjustability of all angles of attack allows reduction of the power required from the vehicle because the most desirable shear angle can be maintained under varying material resistance characteristics.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective showing a mounting assembly embodying this invention before a material treating blade has been installed, and with one end of the frame means which is adapted to support the material blade broken away.

FIG. 2 is a top plan view of the elements shown in FIG. 1 but with parts of one of the frame means broken away;

FIG. 3 is a side elevation of the elements shown in FIG. 2 but with a material treating blade and the forward portion of a tractor added in dot dash lines;

FIG. 4 is a section on the line 4—4 of FIG. 2 but with a material treating blade and the forward portion of a tractor added in dot dash lines;

FIG. 5 is a section on the line 5—5 of FIG. 3;

FIG. 6 is a diagrammatic front elevation looking at the forward end of the mounting assembly, showing in dot dash lines the frame means which is adapted to support the material treating blade tilted in a substantially vertical plane to a plurality of positions about substantially horizontal pivot means to adjust the angle of the

edge of the material treating blade to the surface which is being treated.

FIG. 7 is a diagrammatic top plan view of the assembly, showing in dot dash lines one of the frame means moved about substantially vertical pivot means to a plurality of positions to adjust the angle of the material treating blade relative to the direction of forward movement of the vehicle;

FIG. 8 is a diagrammatic side elevation like FIG. 3 showing in dot dash lines the frame means which supports the material treating blade moved about substantially horizontal pivot means to a plurality of positions to adjust the angle of attack of the edge of the blade to the surface which is being treated;

Fig. 9 is a diagrammatic side elevation like FIG. 3 showing in dot dash lines the frame means which supports the material treating blade moved substantially vertically to a plurality of positions about substantially horizontal pivot means to adjust the height of the edge of the blade relative to the surface which is being treated; and

FIG. 10 is a section on the line 10—10 of FIG. 4 showing the frame means which supports the frame means which supports the material treating blade.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring to FIGS. 1 to 4 of the drawings, the mounting assembly comprises first frame means 10 which includes substantially horizontal side frame members 11 connected together by cross frame members 12 and an upwardly extending member 13 which includes a cross piece 13A and side members 13B.

The side frame members are provided with orifices 11A (FIG. 1) which receive bolts 11B (FIG. 4) for detachably securing the first frame member to frame members 14A of the tractor 14 (FIG. 4).

Second frame means 15 extends forwardly from the first frame means. It comprises side frame members 15A and cross frame members 15B.

The second frame means is secured to the first frame means by first pivot means 16 for movement about an axis which is substantially horizontal and substantially normal to the longitudinal centerline of the second frame means when viewed from the top as in FIG. 2.

First double acting hydraulic motor means 17, comprising a cylinder and ram, has one end pivotally connected at 17A to the lug 13C (FIG. 4) of the cross piece 13A and the other end pivotally connected at 17B between the lugs 15C which are pivotally secured by pivot means 18F to the forward end of the forward cross pieces 15B of the second frame means (FIGS. 1 and 4). This hydraulic motor means is used to move the second frame means vertically about the first pivot means 16 thereby to adjust the height of the edge of the material treating blade relative to the surface which is being treated as shown in FIG. 9.

Third frame means 18 comprises an end member 18A which is U-shaped in cross section and a pair of laterally spaced guide members 18B which are also U-shaped in cross section and which slidably engage the side frame members 15A of the second frame means. Lugs 18C extend inwardly from the rearward ends of the flanges 18B of the guide members and their ends are connected together by bolts 18D which serve to reinforce the flanges and also as stops to limit the out-

ward sliding movement of the guide members 18B relative to the second frame means 15.

The forward ends of the guide members are pivotally secured to the end member 18A by pivot means 18E.

The end member 18A is secured to the second frame means by second pivot means 18F for movement about an axis which is substantially vertical and substantially normal to the longitudinal centerline of the second frame means when viewed from the side.

Second double acting hydraulic motor means 20A and 20B comprise two double acting cylinders and rams, one located adjacent to one side of the second frame means and the other located adjacent to the opposite side thereof as shown in FIG. 2. The forward ends of these hydraulic motor means are pivotally connected at 20C to lugs 18G which are secured to end member 18A (FIGS. 2 and 3). The other ends of hydraulic motor means 20A and 20B are pivotally connected at 20D to lugs 15D which are secured to the side frame members 15A of the second frame means (FIG. 2).

The second hydraulic motor means 20A, 20B move the third frame means 18A about the second pivot means 18F to adjust the angle of the material treating blade relative to the direction of forward movement of the vehicle as shown in FIG. 7.

Fourth frame means 25 is located adjacent to the forward end of the third frame means 18A. It comprises the cross piece 25A which is U-shaped in cross section and an upwardly extending member 25B which is located substantially midway between the ends of the cross piece 25A. The cross piece 25A is pivotally secured at 25C by third pivot means which comprises substantially horizontal pins which pass through orifices in the spaced lugs 25D which are welded to the cross piece 25A and the forwardly extending member 18H of the third frame member 18A (FIG. 2). The axis of this third pivot means is substantially horizontal and substantially normal to the longitudinal centerline of the third frame means when viewed from the top as in FIG. 2.

Third double acting hydraulic motor means 30 comprises a double acting cylinder and ram. The forward end of this motor means is pivotally connected at 30A to the upper end of the upwardly extending member 25B and the other end is pivotally connected at 30B to the member 13C. The height of the upwardly extending member 25B is such that the longitudinal centerline of the third hydraulic motor means is substantially parallel to the second frame means when viewed from the side as in FIG. 3.

The third hydraulic motor means moves the material treating blade about the third pivot means to adjust the angle of attack of the edge of the blade to the surface which is being treated as shown in FIG. 8. It also serves to hold the blade in that position when it is adjusted in other planes.

Fifth frame means 40 is located adjacent to the forward end of the fourth frame means. It comprises the cross piece 40A and the upwardly extending member 40B which is substantially midway between the ends of the cross piece 40A.

The cross piece 40A is pivotally supported on the fourth frame means by fourth pivot means 25E which is secured to the fourth frame means 25A (FIGS. 1, 3 and 4). The axis of this fourth pivot means is substan-

tially horizontal and it is located substantially midway between the ends of the fifth frame means 40 (FIGS. 1 and 6). As shown in FIGS. 10 and 1, a pair of arcuate slots 25H are provided in the fourth frame means 25A and they receive pins 40F which project rearwardly from the cross piece 40A. The arcs of the slots are radial relative to the axis of the fourth pivot means 25E. The slots 25H and pins 40F hold the fifth frame means in position during rotation of the fifth frame means about the fourth pivot means 25E.

Fourth double acting hydraulic motor means 50 comprises a double acting cylinder and ram. One end of this hydraulic motor means is pivotally connected at 50A to the lug 25F of the fourth frame means (FIGS. 1 and 2) and its other end is pivotally connected at 40C adjacent to the upper end of the upstanding member 40B.

The material treating blade 60 is secured to the fifth frame means by the centrally located substantially horizontal pin 40D and a vertical pin 60A (FIGS. 1, 3 and 4) which passes through the central passage of the substantially cylindrical member 40E which extends forwardly near the upper end of the upwardly extending member 40B.

The fourth hydraulic motor means 50 tilts the material treating blade in a substantially vertical plane to a plurality of positions about the fourth pivot means 25E to adjust the angle of the edge of the material treating blade to the surface which is being treated as shown in FIG. 6.

All of the double acting hydraulic motor means are connected to an hydraulic system of the vehicle by conduits which are not shown. These conduits lead to a control valve or control valves so that the operator of the vehicle is able to easily control the reciprocating actions of the rams in the cylinders of the respective double acting hydraulic motor means.

It will be apparent to persons skilled in the art that a mounting assembly embodying this invention fulfills all of the objects of this invention described under Background Of The Invention in the foregoing specification.

While one desirable embodiment of the invention has been shown and described, it is to be understood that this disclosure is for the purpose of illustration only and that various changes in shape, proportion and arrangement of parts as well as the substitution of equivalent elements for those herein shown and described may be made without departing from the spirit and scope of the invention as set forth in the appended claims.

I claim:

1. A mounting assembly for attaching a material treating blade to a vehicle comprising,
 - first frame means for attachment to a vehicle,
 - second frame means extending forwardly from said first frame means,
 - first pivot means for pivotally connecting one end of said second frame means to said first frame means for movement about an axis which is substantially horizontal and substantially normal to the longitudinal centerline of said second frame means when viewed from the top,
 - first double acting hydraulic motor means pivotally connected between said first and second frame means for moving said second frame means about said first pivot means,
 - third frame means adjacent to the forward end of said second frame means,

second pivot means for pivotally connecting said third frame means to said second frame means for movement about an axis which is substantially vertical and substantially normal to the longitudinal centerline of said second frame means when viewed from the side,

second double acting hydraulic motor means pivotally connected between said second and third frame means for moving said third frame means about said second pivot means,

fourth frame means adjacent to the forward end of said third frame means,

third pivot means for pivotally connecting said fourth frame means to said third frame means for movement about an axis which is substantially horizontal and substantially normal to the longitudinal centerline of said third frame means when viewed from the top,

third double acting hydraulic motor means pivotally connected between said first and fourth frame means for moving said fourth frame means about said third pivot means,

fifth frame means adjacent to the forward end of said fourth frame means and adapted to support a material treating blade,

fourth pivot means for pivotally connecting said fifth frame means to said fourth frame means for movement about an axis which is substantially horizontal and substantially midway between the ends of said fifth frame means, and

fourth double acting hydraulic motor means pivotally connected between said fourth and fifth frame means for moving said fifth frame means about said fourth pivot means.

2. A mounting assembly according to claim 1 wherein said fourth frame means comprises a pair of arcuate slots, one at either side of said fourth pivot means, and said fifth frame means comprises a pair of spaced members extending into said slots.

3. A mounting assembly according to claim 1 wherein said second frame means comprises a pair of laterally spaced side members which are substantially parallel to the longitudinal centerline of said second

frame means, said third frame means comprises a pair of rearwardly extending spaced guide members slidably engaging said laterally spaced side members and fifth pivot means for pivotally connecting the forward ends of said spaced guide members to a forward element of said third frame means for movement about axes which are substantially vertical.

4. A mounting assembly according to claim 1 wherein said first frame means comprises a first upwardly extending member and one end of said first double acting hydraulic motor means is pivotally connected to an elevated portion of said first upwardly extending member.

5. A mounting assembly according to claim 1 wherein said first frame means comprises a first upwardly extending member and one end of said third double acting hydraulic motor means is pivotally connected to an elevated portion of said first upwardly extending member.

6. A mounting assembly according to claim 5 wherein said fourth frame means comprises a second upwardly extending member and the other end of said third double acting hydraulic motor means is pivotally connected to an elevated portion of said second upwardly extending member.

7. A mounting assembly according to claim 1 wherein said fifth frame means comprises a third upwardly extending member intermediate its ends, and one end of said fourth double acting hydraulic motor means is pivotally connected to an elevated portion of said third upwardly extending member and the other end of said fourth double acting hydraulic motor means is pivotally connected to an end portion of said fourth frame means.

8. A mounting assembly according to claim 1 wherein said second double acting hydraulic motor means comprises a pair of double acting hydraulic motor means, one located adjacent to one side of said second frame means and the other located adjacent to the opposite side of said second frame means when the assembly is viewed from the top.

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