United States Patent [19]

Patel

[11] **3,909,963**

[45] **Oct. 7, 1975**

[54] **BACK-ACTING SHOVEL WITH COOPERATING SHIELD**

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[22] Filed: **June 27, 1974**

[21] Appl. No.: **483,675**

[30] **Foreign Application Priority Data**

June 28, 1973 France 73.23786

[52] **U.S. Cl.** ..... **37/117.5;** 37/DIG. 3; 214/1 E; 214/138 R; 214/DIG. 5

[51] **Int. Cl.²** **E02F 3/32**

[58] **Field of Search** ..... 37/118 R, 117.5, DIG. 3; 214/DIG. 5, 1 E, 138 R, 138 C

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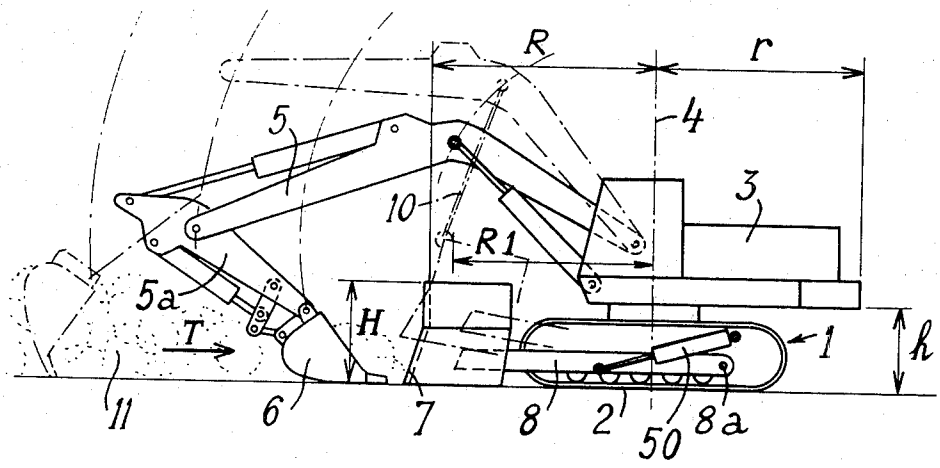
[57] **ABSTRACT**

An earth moving appliance comprises a chassis which may be moved along the ground and which has a turret mounted for rotation about an axis thereon. A jib is pivotally mounted on the turret and carries a working tool such as a bucket. A shield, which may be a blade or skirt, is connected to the chassis, and is movable relative thereto between a first position in which the shield bears against the ground and is disposed between the working tool and the chassis and the second position in which the shield is raised from the ground. The shield is curved and has a centre of curvature which is substantially on the axis of rotation of the turret, the radius of curvature of the shield is such that contact between the shield and the turret on rotation of the latter is avoided. The shield presents a stop surface to the working tool, so that when, for example, the working tool is a bucket the shield facilitates loading of the bucket with material.

6 Claims, 5 Drawing Figures



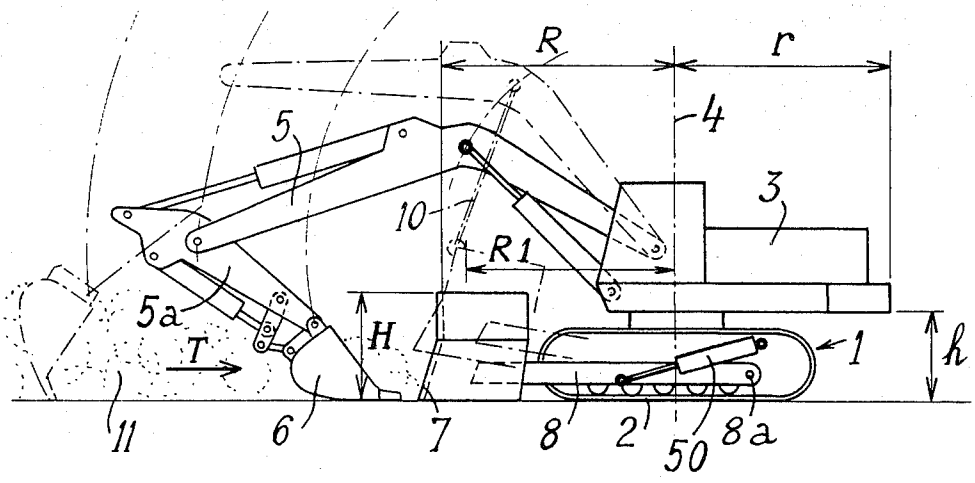


Fig-1

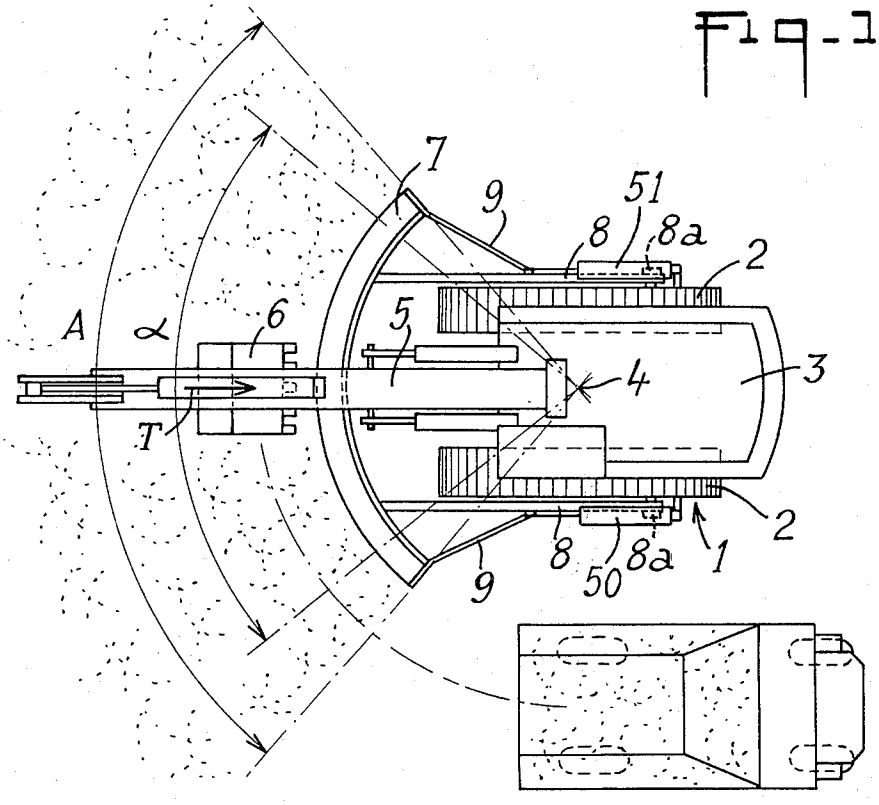


Fig-2

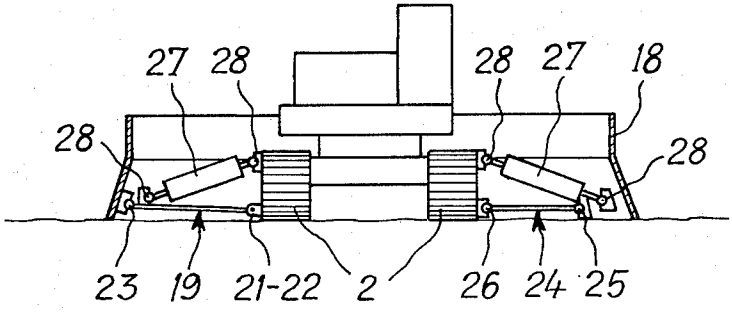


Fig-5

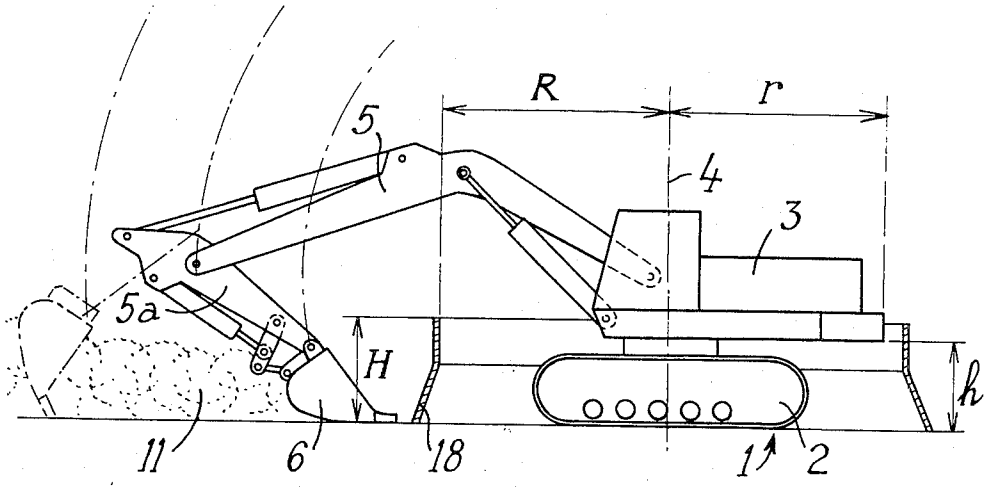
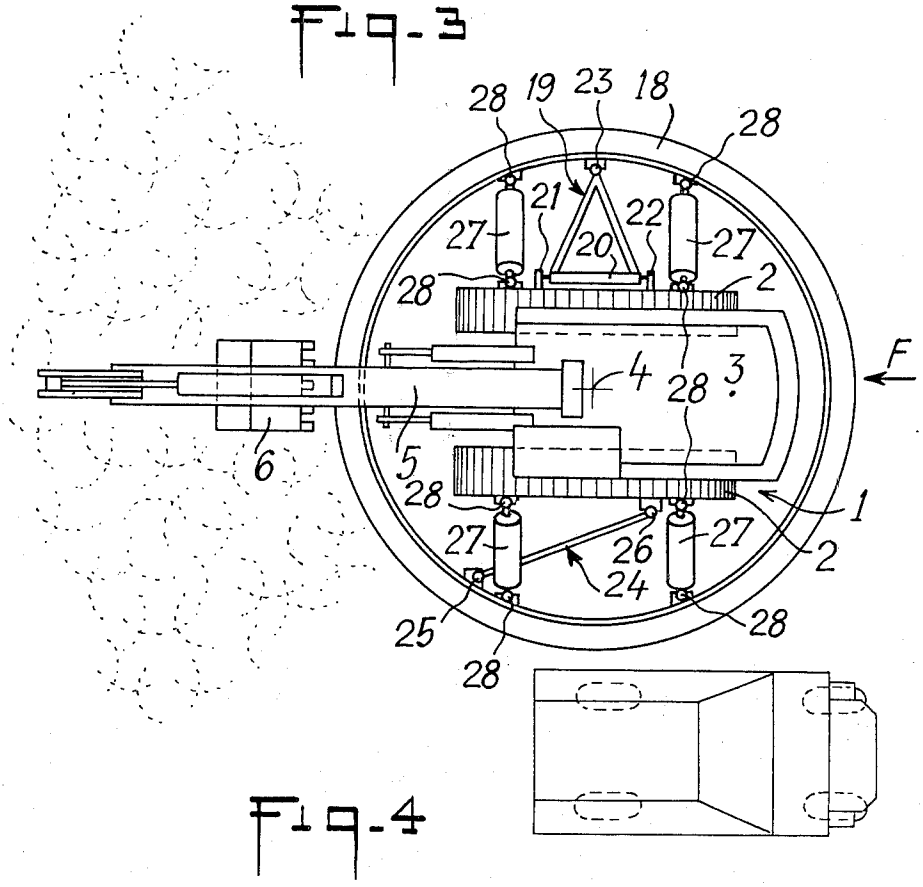

R
r
5
4
3
5a
H
h
11
6
18
1
2

Fig-3


28
19
23
18
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28
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F
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1
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26
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Fig-4

BACK-ACTING SHOVEL WITH COOPERATING SHIELD

This invention relates to earth moving appliances.

Back-acting operation of a shovel is such that material is loaded into a bucket of the shovel by movement of the bucket, provided on a jib, in a direction which towards a chassis of the shovel. Back-acting of a shovel is particularly advantageous in the case in which forward-loading of a bucket is difficult to effect. For example, when loading quarry stones from a pile thereof, forward-loading of a bucket may be made difficult by the presence of a retaining quarry face situated just behind the pile of quarry stones. In such a situation it is preferable to use a back-acting shovel which requires far less force to cause the bucket to penetrate the pile of quarry stones thus improving the profitability of the shovel and in addition making it possible to use the bucket in a raised position in order to detach material from the quarry face.

Back-acting operation of a conventional shovel nevertheless has the disadvantage that the material to be loaded into the bucket is displaced in the direction of the chassis of the shovel, and this tends to cause the material to collect too close to the chassis to be loaded into the bucket.

According to the present invention there is provided an earth moving appliance comprising: a chassis, means for moving the chassis; a turret mounted for rotation on the chassis about an axis; a jib pivotally mounted on the said turret and carrying a working tool, each of the positions which the turret can assume relative to the chassis defining a working direction of the working tool, and shield means connected to the chassis and movable relative thereto between a first position in which the shield means bears against the ground and is disposed between the working tool and the chassis, and a second position in which the shield means is raised from the ground, the shield means being curved and having a centre of curvature which is substantially on the axis of rotation of the turret, the radius of curvature of the shield means being such that contact between the shield means and the turret on rotation of the latter is avoided, the shield means, when in the first position, presenting a stop surface to the working tool at least in a number of said working directions thereof.

Preferably, in operation, the vertical height of the shield means is greater than the minimum distance between the ground and the turret.

In one embodiment the shield means is a blade arcuate in plan and subtending a predetermined angle to the axis of rotation of the turret, the blade having a substantially part-frusto conical portion and/or a substantially part cylindrical portion and being supported from the chassis by a pair of arms, lifting means being connected to the blade to move it between said positions. The lifting means may comprise or include at least one hydraulic jack operatively connected between the chassis and the blade. Additionally, or alternatively the lifting means may comprise or include a removable connector extending between the blade and the jib.

In a second embodiment the shield means comprises a skirt which is arcuate in plan and surrounds the chassis, a plurality of jacks being operatively connected between the skirt and the chassis to move the skirt between said positions, support means being articulated to and extending between the skirt and the chassis, the support means being such that the skirt remains substantially coaxial with the axis of rotation of the turret at all times.

The invention is illustrated, merely by way of example, in the accompanying drawings,

FIG. 1 is a side elevational view of one embodiment of an earth moving appliance according to the present invention,

FIG. 2 is a top plan view of the appliance of FIG. 1,

FIG. 3 is a side elevational view of a second embodiment of an earth moving appliance according to the present invention,

FIG. 4 is a top plan view of the appliance of FIG. 3, and

FIG. 5 is a view of the appliance of FIG. 4 looking in the direction of the arrow F.

Referring to FIGS. 1 and 2 there is illustrated one embodiment of an earth moving appliance according to the present invention. The appliance has a chassis 1 having caterpillar tracks 2. A turret 3 is mounted on the chassis 1 for pivotal movement about an axis 4. A jib 5 is pivotally mounted by one end on the turret 3 and, at its other end, is connected to a rocking lever 5*a* carrying a bucket 6 of the back-acting type. An arcuate shield or blade 7 is mounted from the rear (as seen in FIG. 1) of the chassis via a pair of carrier arms 8 for pivotal movement about an axis 8*a*. Reinforcement members 9, one at each end of the blade 7, strengthens the latters connection to the arms 8. The blade 7 is shown in solid lines in FIG. 2 in contact with the ground. The blade 7 has a centre of curvature which is located substantially on the axis 4 at which the blade subtends an angle A. The blade 20 has a lower portion which contacts the ground and which is a sector of a frusto-cone and an upper sector of a cylinder. It will be appreciated that the blade may consist merely of either a substantially part frusto-conical portion or a substantially part-cylindrical portion.

By virtue of its shape the blade is at all times facing the working direction of the bucket 6, which direction is indicated by the arrow T, the jib 5 being within the angle A defined by the blade at the axis 4.

A raised position of the jib 5 and the blade 7 is shown in dot-dash lines in FIG. 1. The jib 5 is maintained in this raised position by a removable connector 10 connected between the blade 7 and the jib 5. When the jib 5 is raised, the blade 7 is also raised by virtue of the connector 10. The connector 10 is only connected between the blade 7 and the jib 5 when the appliance is to be moved and is removed when the appliance is operational.

Hydraulic jacks 50, 51, operatively connected between the chassis 1 and the arms 8, may either alone or in cooperation with the connector 10, cause the blade to be raised from the ground. The force which the jacks 50, 51 apply to the arms 8 causes — or tends to cause in the case where they cooperate with the connector 10 — the blade to be raised, and, when it is so raised, permit the appliance to be moved.

The raised position of the jib defines the useful lifting height of the appliance. It will be noted from FIG. 1 that the blade 7, which has an internal radius of curvature R, tends to move to approach the axis 4 when it is raised. In its maximum raised position, the blade is situated at a minimum distance R1 from the axis 4, the distance R1 being less than the radius of curvature R. Since the turret 3 extends to the rear (as seen in FIG.

1) of the axis 4 to a maximum distance *r*, it is necessary, particularly in the case where the blade is maintained in the raised position by the jacks **50, 51,** that the distance R1 should be greater than the distance *r*, in order to permit the turret to rotate through **360°** without interfering or coming into contact with the blade.

The blade **7** constitutes, in fact, a stop for material collected from a heap **11** by the bucket **6.** When operating in the working direction the bucket **6** tends to drive material under the chassis **1** of the shovel. The blade **7** frustrates this tendency and at the same time permits better loading of material into the bucket. The shape of the blade, which is arcuate so that it can always be substantially perpendicular to the working direction of the bucket, and which is relatively high so that a minimum volume of material can pass over it, substantially improves the performance of the appliance. The vertical height H of the blade, when it is in contact with the ground, is, as will be seen from FIG. **1,** greater than the minimum *h* between the turret **3** and the ground.

Referring to FIGS. **3** to **5** there is shown another embodiment of an earth moving appliance according to the present invention. The parts of this embodiment similar to the parts of the appliance shown in FIGS. **1** and **2** have been designated by the same reference numerals and will not be described further in detail. In this embodiment the blade **7** of this appliance of FIGS. **1** and **2** is replaced by a shield or skirt **18** which completely encircles the chassis **1.** The skirt **18** is connected to the chassis **1** by a triangular member **19,** a base **20** of which is pivotally mounted at **21, 22** on the chassis adjacent one of the caterpillar tracks **2,** and an apex of which is articulated by means of a ball joint **23** on the inside face of the skirt **18.** A bar **24** extends between the the skirt **18** and the chassis **1** adjacent the other caterpillar track **2,** the bar **24** being articulated to the skirt **18** and the chassis **1** by ball joints **25, 26** respectively. In FIG. **5,** which is a view in the direction of the arrow F in FIG. **4,** with the front part of the skirt **18** removed, it can be seen that the triangular member **19** and the bar **24** are in a substantially horizontal plane adjacent the ground if the skirt is in contact therewith.

A plurality of jacks **27** are connected by means of ball joints **28** between the skirt **18** and the chassis **1** adjacent the upper portion of the caterpillar tracks **2.** In FIG. **5** it can be seen that these jacks are inclined to the horizontal when the skirt is in contact with the ground. Thus, if the jacks **27** are retracted the skirt will be raised from the ground, whereas if the jacks are extended the skirt will be urged into contact with the ground.

The triangular member **19** and the bar **24** maintains the skirt **18** substantially coaxial with the axis **4** of the turret at all times.

When the jacks **27** are retracted and locked in a retracted position, the skirt **18** is maintained at a given distance from the ground, and the appliance can thus be moved. When the jacks are extended and locked in an extended position the skirt **18** is urged into contact with the ground to an extent that it can account of irregularities of the surface thereof. When the jacks **27** are locked in either the retracted position or the extended position, the skirt **18** is, in effect, an integral part of the chassis **1.**

The advantage of the shield **18** is that the bucket can be used in conjunction with the skirt in any position of the turret whereas with the appliance shown in FIGS. **1** and **2,** the bucket can only be used in conjunction with the blade **7** within a limited angular range α of working positions of the turret **4.** In addition, the skirt constitutes a "barrier" inside which the turret **3** can rotate without risk of accident.

The bucket of the above described appliances, and especially the appliance of FIGS. **1** and **2,** may, if desired, be replaced with another form of working tool, such as, for example, a scraper blade for the purpose of cleaning a surface on which repair or excavation work has been carried out.

The earth moving appliances described above may advantageously be used as public works equipment.

What is claimed is:

1. An earth moving appliance comprising: a chassis; means for moving the chassis; a turret mounted for rotation on the chassis about an axis; a jib pivotally mounted on the said turret and carrying a working tool, each of the positions which the turret can assume relative to the chassis defining a working direction of the working tool; and shield means connected to the chassis and movable relative thereto between a first position in which the shield means bears against the ground and is disposed between the working tool and the chassis, and a second position in which the shield means is raised from the ground, the shield means being curved and having a centre of curvature which is substantially on the axis of rotation of the turret, the radius of curvature of the shield means being such that contact between the shield means and the turret on rotation of the latter is avoided, the shield means, when in the first position, presenting a stop surface to the working tool at least in a number of said working directions thereof.

2. An appliance as claimed in claim **1** in which, in operation, the vertical height of the shield means is greater than the minimum distance between the ground and the turret.

3. An appliance as claimed in claim **1** in which the shield means is a blade arcuate in plan and subtending a predetermined angle to the axis of rotation of the turret, the blade having a substantially part-frusto conical portion and a substantially part-cylindrical portion and being supported from the chassis by a pair of arms, lifting means being connected to the blade to move it between said positions.

4. An appliance as claimed in claim **3** in which the lifting means comprises at least one hydraulic jack operatively connected between the chassis and the blade.

5. An appliance as claimed in claim **3** in which the lifting means comprises a removable connector extending between the blade and the jib.

6. An appliance as claimed in claim **1** in which the shield means comprises a skirt which is arcuate in plan and surrounds the chassis, a plurality of jacks being operatively connected between the skirt and the chassis to move the skirt between said positions, support means being articulated to and extending between the skirt and the chassis, the support means being such that the skirt remains substantially coaxial with the axis of rotation of the turret at all times.

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