Feb. 7, 1967 G. FUENTES, JR 3,302,540

METHOD AND APPARATUS FOR COMPACTING, ROLLING AND FINISHING THE EARTH

Filed March 2, 1964 2 Sheets-Sheet 1

Fig. 1.

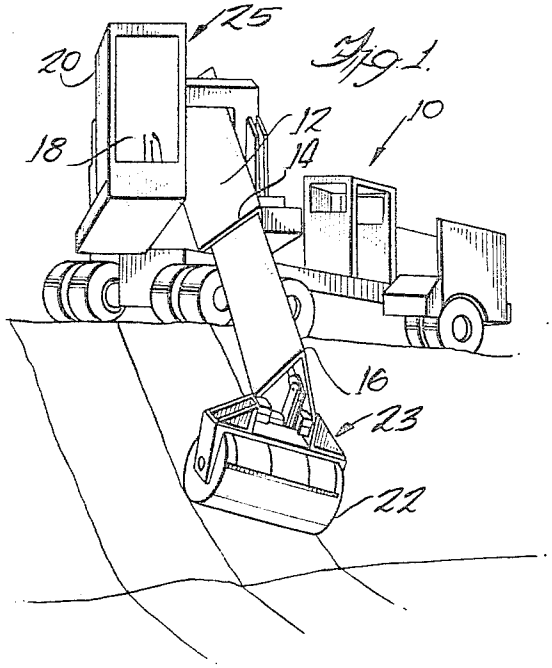



Fig. 2.

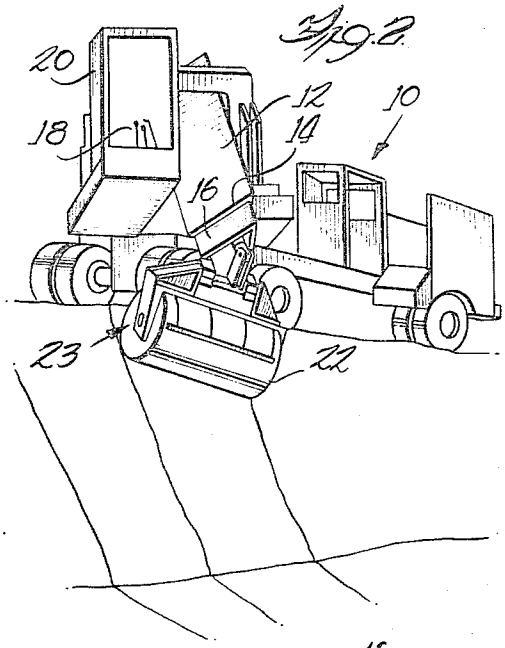



Fig. 3.

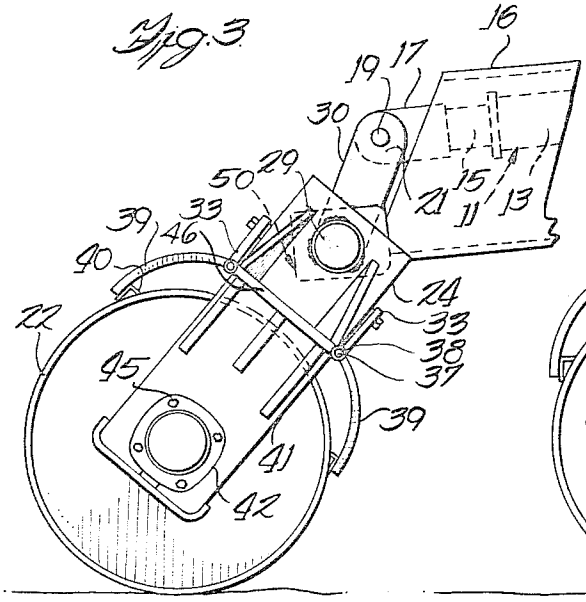
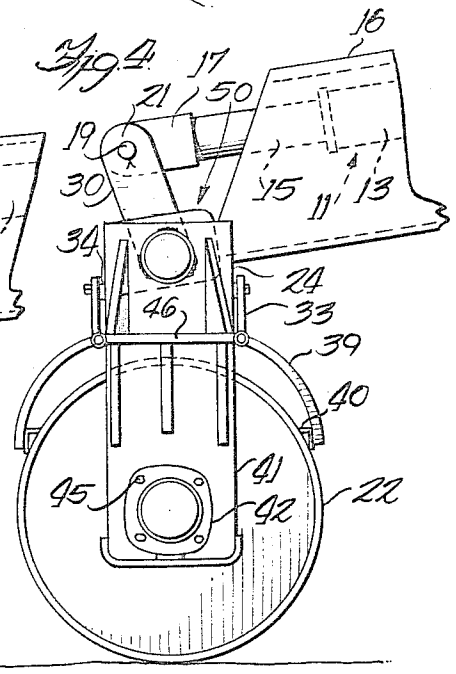



Fig. 4.




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Feb. 7, 1967 G. FUENTES, JR 3,302,540

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Filed March 2, 1964 2 Sheets-Sheet 2

Fig. 5.

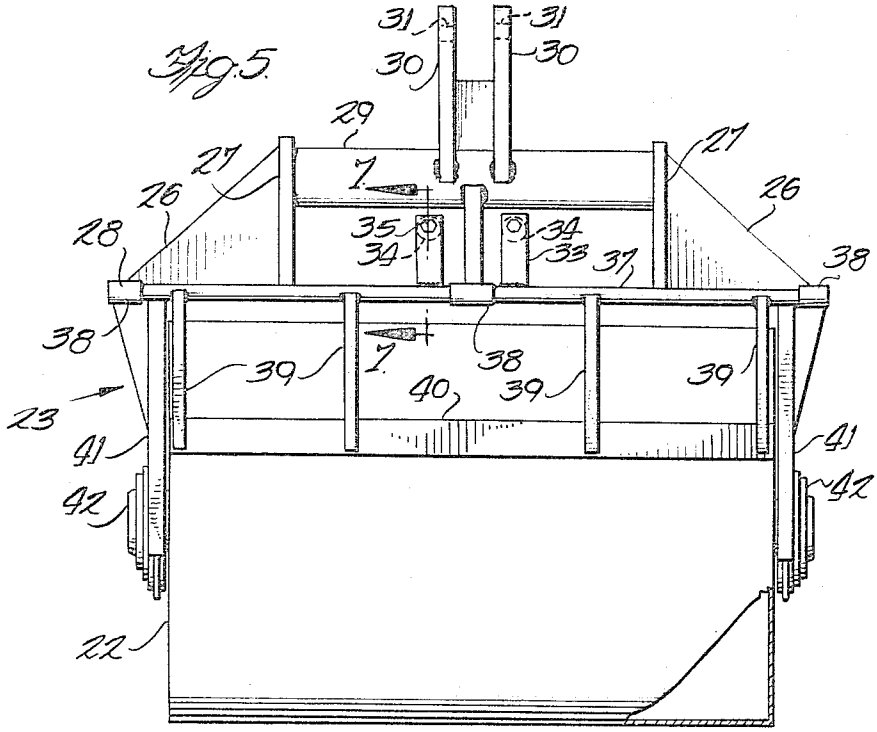



Fig. 6.

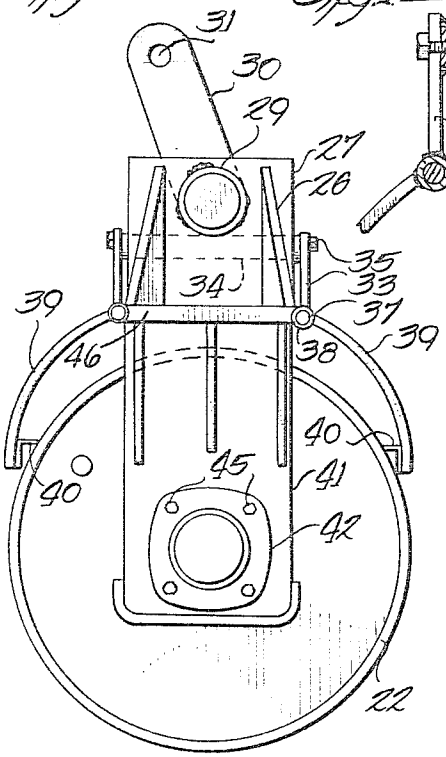



Fig. 7.

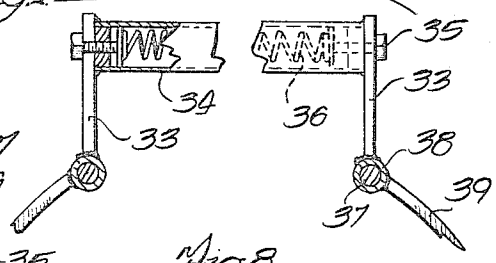
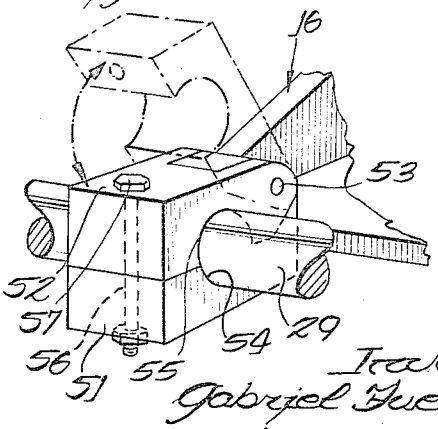



Fig. 8.




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# METHOD AND APPARATUS FOR COMPACTING, ROLLING AND FINISHING THE EARTH

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8 Claims. (Cl. 94—50)

This invention relates to ground working equipment and more particularly, it relates to an attachment for ground working equipment.

A major industry today, is the manufacturing of earth or ground working equipment, particularly of the mechanized type which can perform the job laborers normally perform, such as moving, digging, leveling, filling, packing, rolling and finishing the earth. This equipment may be manufactured to perform a specific job, such as digging; however, in most cases, it is designed to handle various attachments whereby the equipment is made more versatile. The present invention relates to one of these attachments, and in particular, a compaction roller attachment.

It is particularly desirable when performing a compaction operation to, at the same time, roll and finish the earth's surface to eliminate the need to perform these operations at another time and with additional equipment. The presently known compaction rollers are, however, useful primarily for the purpose of compaction of level surfaces and when it is desired to roll and finish the earth's surface, different attachments must be used and these operations subsequently performed. It is, therefore, the principal object of this invention to provide ground working equipment having a compaction roller attachment which is capable of performing the compaction operation, the rolling operation and the finishing operation, simultaneously.

It is a further object of this invention to provide ground workng equipment having a compaction roller attachment of the above-described type which may be easily attached to, and removed from, the equipment.

It is a still further object of this invention to provide ground working equipment having a compaction roller attachment of the above-described type which is constructed with a minimum number of movable parts, making the same virtually maintenance free. In this respect, it is a still further object to construct the compaction roller attachment using a minimum number of fastening devices, such as nuts and bolts; the parts instead being secured together by means of welds.

It is a still further object of this invention to provide ground working equipment having a compaction roller attachment of the above-described type which is pivotal to provide a greater range of action, and to provide a greater compaction.

It is a still further object of this invention to provide a new and improved compaction roller and method for compacting, rolling and finishing the earth.

One type of earth working equipment well known in the industry today is the multi-purpose Gradall equipment. This equipment may be briefly described as a machine having a boom to which a number of special attachments for performing different earth working jobs may be connected. A machine of this type is described more fully hereinafter, and while the present invention is described, and is particularly applicable, as an attachment therefor, it may be used with any type of equipment



which has a longitudinally extendable boom and preferably, but not necessarily, a hydraulic piston arrangement included in the boom to impart a pivotal action to the compaction roller.

A compaction roller illustrative of the present invention consists of a cylindrical member, closed at both ends, which is secured in a sturdy framework which is, in turn, specially designed and constructed to be removably attached to a boom, such as the type used on the above-mentioned Gradall machines. By manipulating the boom, the compaction roller may be used for compaction, for rolling and for finishing the earth.

The objects of this invention, as well as the construction of the compaction roller, the manner in which it is attached to a boom and the method in which it is used for performing the compaction, the rolling and the finishing operation, will be more fully understood by reading the following specification in connection with the accompanying illustrative drawings, in which:

FIGURES 1 and 2 are pictorial views of a mechanized, motorized earth-working machine having a telescopic boom to which there is attached a compaction roller, constructed in accordance with the present invention. In FIGURE 1, the telescopic boom is shown extended and, in FIGURE 2, it is shown withdrawn;

FIGURES 3 and 4 are side views showing the compaction roller and a section of the telescopic boom and the hydraulic piston arrangement included therein, the hydraulic piston being shown in a withdrawn and in an extended position in FIGURES 3 and 4, respectively;

FIGURE 5 is a front view of the compaction roller;

FIGURE 6 is a side view of the compaction roller;

FIGURE 7 is a side, partial view of the spring tensioning device for the roller scraper blade, with a portion of the tensioning device cut-away to show the spring mounted therein; and

FIGURE 8 is a front perspective view of the mounting means attached to the boom.

Referring now to FIGURES 1 and 2 of the drawings, a motorized ground working vehicle **10** is shown which has attached thereto an assembly **25** which includes a cab **20** and a boom **12**. Boom **12** has a fixed section **14** and a movable section **16** which is telescopically arranged therein. Vehicle **10** also includes appropriate control means (not shown) of the type well known in the art which are activated by the levers **18** to maneuver assembly **25** to position boom **12** in various operative positions and to control the telescopic movement of section **16**. Boom **12** is also arranged to handle a number of attachments, such as digging buckets, dredging buckets and scraper blades, so that a number of different operations may be performed with the vehicle **10**.

An illustrative compaction roller attachment provided by the present invention is shown, in FIGURES 1 and 2, attached to the end of movable section **16** of boom **12**. As will be more fully described hereinafter, boom **12** is manipulated so as to cause compaction roller **23** to be moved over the ground to compact, to roll and finish the same, in a single operation.

Referring now to FIGURES 3–6, the compaction roller **23** is shown in greater detail. Compaction roller **23** includes a cylindrical roller **22** which is closed at both ends and may have a shaft (not shown) extending through its center. Roller **22** may be filled with water, or sand, for greater weight by removing the plug **43**; however, it has been found that in most cases the pressure which

may be applied by the boom mechanism of the vehicle 10 to force compaction roller 23 against the earth is sufficient to accomplish the work.

Roller 22 is supported by its center shaft or trunnions in a U-shaped framework comprising the upright supports 41 and the horizontal support 46 by means of ball-bearing assemblies (not shown) which are secured in the upright supports 41. These ball-bearing assemblies are encased and sealed to prevent them from being damaged by dirt by the bearing covers 42 which are secured to upright supports 41 by means of the screws or the like 45.

Attached to the U-shaped framework are two upright supports 27 which support the mounting shaft 29. Supports 27 are rigidly attached to horizontal support 46, and are further supported by the triangularly shaped members 26. Mounting shaft 29 is preferably a solid cylindrical shaft, and is rigidly secured to supports 27, although suitable end shafts or trunnions may be employed. Attached to mounting shaft 29 are a pair of angularly-mounted pivot ears 30 having apertures 31 formed therein for receiving a pin 19.

An L-shaped scraper blade 40 is attached to the horizontal support member 46 by means of the support arms 39 which are, in turn, connected to the shaft 37. Shaft 37 is supported on the horizontal support member 46 by the hinges 38. A scraper blade 40 extends across the entire width of the roller 22 and is positioned slightly above the centerline of the roller 22. The scraper blade 40 is provided to keep the roller surface clear from material that adheres to the roller 22 in order that the roller may render a smooth finished, rolled surface. It is found that by positioning the scraper blade 40 slightly above the center of the roller 22, as shown in FIG. 5, the scraper blade assists the most in keeping roller 22 free of this material.

Connected to the scraper blade 40 is a scraper blade tensioning device, which may be best seen in FIGURE 7. The scraper blade tensioning device consists of two units, each of which comprises two upright support members 33, one of which is rigidly secured to the front and rear support bars 37, respectively. A spring 36 is connected by means of the adjustable assembly 35 between the front support member 33 and the corresponding rear support member 33, as shown in FIGURE 7. The spring 36 is enclosed within a tubular casing 34 to prevent deformation when compressed. The springs 36 and the adjustable assemblies 35 associated therewith are connected to the support members 33 in a fashion such that the scraper blades 40, connected to the support members 33, are urged against the roller 22.

The degree to which the scraper blades 40 are urged against the roller 22 may be varied by adjusting the adjustable assemblies 35. For example, by rotating the adjustable assemblies 35 in a clockwise direction, the spring 36 is compressed to, in turn, cause the support members 33 and the support bar 37 connected thereto to pivot in a clockwise direction in the hinges 37, thereby urging the scraper blade 40 against the roller 22. Rotating adjustable assemblies 35 in a counter-clockwise direction has the opposite effect of lessening the degree to which scraper blade 40 is urged against roller 22.

The support members mentioned above, as well as any other members of the compaction roller 23, such as ears 30, are preferably secured to one another by welding. This will make the compaction roller virtually maintenance free since, as it may be noted, there are a minimum number of moving parts which require attention.

The compaction roller 23 is easily connected to the boom 12. As shown in FIG. 8, the boom 12 has connected thereto a mounting assembly 50 which includes a fixed section 41 and a movable section 52 pivotally mounted thereto by means of the shaft 53. Fixed section 51 has a semi-circular cutout 54 and movable section 55 likewise has a semi-circular cutout 55. When fixed section 51 and movable section 55 are closed, these cutouts form an aperture to receive the mounting shaft 29. In connecting compaction roller 23 to the boom 12, the boom is maneuvered to a position such that the mounting shaft 29 engages the fixed member 51 of the attaching means 50. The movable member 52 of attaching means 50 is then merely pivoted about the shaft 33 to enclose the mounting shaft 29, and the bolt 56 inserted and secured by the nut 57. The hydraulic mechanism 13 is then operated until the connecting means 17 connected to the piston 15 is properly located between the ears 30, to allow the pin 19 to be passed through the apertures 31 in ears 30 and an aperture (not shown) in connecting means 17. Pin 19 is secured by means of the cotter-pin 21, which is inserted in an aperture in the pin 19 and spread to prevent it from falling out.

The compaction roller 23 is particularly useful in forming embankments, which may be angled, for example, at 45°. As may be seen in FIGURES 1 and 2, the vehicle 10 is parked beside the embankment which is to be compacted, rolled and finished. By means of the control levers 18 included in the cab 20, the boom 12 is maneuvered so that the compaction roller 23 is rolled up and down the embankment. By controlling the pressure exerted downwardly by the boom 12, the earth beneath the compaction roller 23 may be progressively compacted until a firm surface is provided. Furthermore, since scraper blades 40 keep the roller 22 free of foreign material, compaction roller 23 may be continuously rolled up and down the embankment until a smooth finished surface is provided.

The ears 30 connected to the mounting shaft 29 and the hydraulic mechanism 11 provide a pivot action which gives compaction roller 23 a far greater range of action, as may be seen in FIGURES 3 and 4. The ears 30 are rigidly attached to the mounting shaft 29, and when the piston 15 is extended from or withdrawn into cylinder 13 the compaction roller 23 is forced to pivot about mounting shaft 29 (since mounting shaft 29 is held by the mounting means 50 attached to the boom 12). This pivot action forces the roller 22 away from the boom 12 as the piston 15 is withdrawn into the cylinder 13, and forces roller 22 toward the boom 12, as the piston 15 is expelled.

It also may be noted that this action, in addition to giving the compaction roller 23 a greater range of action, allows the compaction roller 23 to be used to compact an area which may be particularly hard, or course, and provide a firm, finished surface. For example, the boom 12 can be maneuvered to place the compaction roller 23 over the rough area, with the roller 22 forced outwardly and compressed against the earth, as shown in FIGURE 3. By maintaining the boom 12 in the same position and by applying the same amount of pressure to compaction roller 23, the rough area may be more firmly compacted by forcing the roller 22 to roll back and forth over the earth by means of the hydraulic mechanism 11. In this fashion, a far greater force may be exerted by the compaction roller 23 on the rough area since the roller 22 is drawn from the angular position shown in FIGURE 3 to the perpendicular position shown in FIGURE 4.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in carrying out the above method and in the construction set forth without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention, which, as a matter of language, might be said to fall therebetween.

I claim:

1. A compaction roller attachment for earth working equipment having a telescopic boom with hydraulic piston means included therein comprising a closed cylindrical member adapted to be filled with water or sand, a support frame including bearing means, a shaft extending through said cylindrical member and engaging said bearing means, scraper means hinged to said support frame and positioned to engage said cylindrical member at a point above the centerline of said cylindrical member, tensioning means connected to said scraper means for forcibly maintaining said scraper means against said cylindrical member including a pair of upright support members, a tubular casing connected between said upright support members, spring means included in said tubular casing forcibly bearing upon said upright support members to urge said scraper means against said cylindrical member and means for adjusting the tension exerted by said spring means against said upright support members, and attachment means connected to said support frame for connecting said compaction roller attachment to said telescopic boom including a pair of upright members rigidly secured to said support frame, a shaft member rigidly secured between said pair of upright members and adapted to be pivotally affixed to the end of said boom transversely thereto, and a pair of pivot ears connected to said shaft member and adapted to be affixed to one end of said hydraulic piston means whereby the extension and retraction of said hydraulic piston means pivots said support frame and said cylindrical member about the pivotal connecting point between said shaft member and said boom.

2. A compaction roller attachment for earth working equipment having a telescopic boom comprising a closed cylindrical member, a support frame having a horizontal member and two downwardly extending support members, bearing means connected to each of said downwardly extending support members, bearing cover means for protecting said bearing means from dirt and the like, a shaft extending through said cylindrical member and engaging said bearing means, scraper means hinged to said support frame and positioned to engage said cylindrical member at a point above the centerline thereof for removing material adhered to said cylindrical member, tensioning means connected to said scraper means for forcibly maintaining said scraper means against said cylindrical member including a pair of upright support members, a tubular casing connected between said upright support members, spring means included in said tubular casing forcibly bearing upon said upright support members to urge said scraper means against said cylindrical member and means for adjusting the tension exerted by said spring means against said upright support members, and attachment means connected to said support frame for connecting said compaction roller attachment to said telescopic boom including a pair of upright members rigidly secured to said support frame, a shaft member rigidly secured between said pair of upright members and adapted to be pivotally affixed to the end of said boom transversely thereto, and a pair of pivot ears connected to said shaft member and adapted to be affixed to one end of said hydraulic piston means whereby the extension and retraction of said hydraulic piston means pivots said support frame and said cylindrical member about the pivotal connecting point between said shaft member and said boom.

3. Earth working equipment including a telescopic boom having hydraulic piston means included therein, control means for maneuvering said boom to locate the same in a plurality of different positions and for extending and withdrawing said hydraulic piston means and attaching means connecting a compaction roller attachment to said boom and to said hydraulic piston means, said roller attachment comprising a cylindrical roller rotatably mounted in a support frame, a shaft member rigidly secured to said support frame and engaged by said attaching means and pivotally connecting said compaction roller attachment to said boom transversely thereto, and a pair of pivot ears rigidly connected to said shaft member and engaged by said hydraulic piston means for pivoting said compaction roller attachment about said shaft member when said hydraulic piston means is extended and withdrawn.



4. Earth working equipment, as claimed in claim 3, wherein said attaching means is fixedly secured to the end of said boom and has a pair of clamp members adapted to be opened and closed to pivotally secure said shaft member therein, whereby said attachment may be easily and quickly removed from said boom by opening said pair of clamp members to release said shaft member and by disconnecting the end of said hydraulic piston means from said pivot ears.

5. Earth working equipment including a telescopic boom having hydraulic piston means included therein, control means for maneuvering said boom to locate the same in a plurality of different positions and for extending and for withdrawing said hydraulic piston means and attaching means connecting a compaction roller attachment to said boom and to said hydraulic piston means, said roller attachment comprising a cylindrical roller rotatably mounted in a support frame, scraper means connected to said support frame for removing material adhered thereto, tensioning means connected to said support frame and to said scraper means for forcibly urging said scraper means against said cylindrical roller, a shaft member rigidly secured to said support frame and engaged by said attaching means and pivotally connecting said compaction roller attachment to said boom transversely thereto, and a pair of pivot ears rigidly connected to said shaft member and engaged by said hydraulic piston means for pivoting said compaction roller attachment about said shaft member when said hydraulic piston means is extended and withdrawn.

6. A compaction roller attachment for earth working equipment having a telescopic boom with hydraulic piston means included therein comprising a cylindrical member closed at both ends, a substantially U-shaped support frame having its cross member pivotally affixed to the end of said boom transversely thereto with the two arms thereof depending downwardly, axle means rotatably supporting said cylindrical member between the arms of said support frame, pivot ears affixed to said cross member and to one end of said hydraulic piston means, the extension and retraction of said hydraulic piston means pivoting said support frame and said cylindrical member about the pivotal connecting point between said cross member and said boom, whereby said roller attachment can be extended and pivoted simultaneously.

7. A compaction roller attachment, as claimed in claim 6, further including attachment means adapted to be fixedly secured to the end of said boom and having a pair of clamp members adapted to be opened and closed to pivotally secure said cross member therein, whereby said attachment may be easily and quickly removed from said boom by opening said pair of clamp members to release said cross member and by disconnecting the end of said hydraulic piston means from said pivot ear.

8. A compaction roller attachment as claimed in claim 6 further including scraper means hinged to said support frame on each of its opposite sides for removing material adhered to said cylindrical member, tensioning means connected to said scraper means for forcibly urging said scraper means against said cylindrical member, said tensioning means including a pair of upright support members affixed at one end to respective ones of said scraper means, a tubular casing connected between said upright support members, spring means included in said tubular casing forcibly bearing upon said upright support members to urge said scraper means against said cylindrical

member, and means for adjusting the tension exerted by said spring means against said upright support members.


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