ABSTRACT: Roller means removably attachable to the back side of the digging bucket of hydraulic backhoes operable, when the open face of the bucket is facing at least to some degree upwardly, to roll and compact earth; the effective rolling width of the roller means being substantially equal to the width of the digging bucket; a sheep's foot roller useable as such roller means with cleaning plates provided in association therewith; alternate roller means provided of substantially continuous available rolling surface to handle silt-rolling operations.
ROLLED ATTACHMENTS TO HYDRAULIC BACKHOE

Numerous types of backhoe devices have been developed and commercialized, ranging from relatively small devices attached to a standard tractor (which may also carry on its front end a loader) to very large commercial units utilizing buckets ranging typically from 18 to 36 inches in width and having up to a 2 1/2-yard bucket capacity.


Armitton shows the use of large-scale sheep's foot rollers on a driven machine associated with a blade for spreading or grading loose earth material, the sheep's foot rollers mounted on axles as wheels and covering the width of the machine and blade. Gilreath shows a clodbreaker comprising a plurality of notches, or serrated wheels mounted on the same axle and extending essentially the width of the carrying vehicle's wheels, or greater, means being provided to raise and lower same. A scraper may be associated with the clodbreaker wheels. Linneman shows a frame (FIG. 4) which is too large to fit in the trench and thus one cannot roll to the sides of the trench.

Referring for example to devices of the character of Linneman, for respective use the road must be smooth. Additionally, a roller such as shown will not be able to pack the edges of the trench because it would be wider than the narrow roller shown. Yet further such a device would not handle tapered (with respect to depth cross section) ditches, as the blade would go over them.

The basic purposes of backhoes are to dig trenches and holes. Typical excavation purposes would include construction of septic tanks, manholes, gasoline tank implantations, basements and garage footings.

The analogy of use of a backhoe is to the human arm with a 15-18-foot reach. Not only does the backhoe pull the digging bucket thereof toward the tractor or vehicle, but it also curls the bucket under and up thereby to pick up the dirt. Then it swings to the side and straightens the "hand" (bucket) out to dump the dirt where desired.

In digging a trench, particularly for pipe implantation (typically sewage or water pipes) one typically will put a lift of sand or gravel in the bottom of the trench, which is considered bedding rock or sand under the pipe.

In a sewer job, there are stakes set up to indicate requirements to excavate to a certain depth. A manhole is typically positioned in the street and then one goes across the curb to another manhole. Grade stakes are employed for the purpose of making trenches to a depth whereby water may be flowed on gravity around the town. There are curb and gutter grades in the street.

Pressure piping, on the other hand, follows the contours of the land and the digger grades to an equal depth.

A large backhoe can typically work from ground level to 20-foot depth. A smaller backhoe can work to a depth of 12 feet.

The average width of trenches is 2 feet.

With respect to filling in trenches, city specifications usually provide that the trenches be compacted back, even on parkings. The only places that the trenches would not be compacted back would be on rights-of-way or easements, which permit settling. All driveways are packed. 95 percent of the filled trenches are tested. If the company reputation is reliable, only one or two tests on a job may be made.

Each plan specifies that fills go back in 6-12 to 18-inch-thick lifts.

The city specifications provide that the operation is not to over dig the trench bottom with respect to the pipe width. The standard bucket is 24 inches wide; any size of machine.

It is quite common for operators of hydraulic backhoes to use the rear face of the backhoe in pounding dirt and gravel back into a trench. However, this is very hard on the mechanism, attachments, etc. and the manufacturing company will remove the warranty if it finds out that such is being done.

The old cable backhoe machines had insufficient versatility of the bucket to be able to tamp. However, this is not true of the presently available hydraulic machines.

A main typically includes utilities, telephone cables and sewer or water pipes. Sewer pipes are typically machine laid and pushed together and have slip joints. Water pipes nowadays have slip joints with gaskets.

An object of the instant invention is to provide a useful attachment to a backhoe.

Another object of the instant invention is to provide a roller attachment adaptable to be removable fixed to the backhoe to enable filling operations to be completed with proper compaction of the backfill.

Another object of the instant invention is to provide sheep's foot roller and silt-type roller attachments for backhoes both of which greatly improve the scope and usefulness of the backhoe for a variety of uses, with the various devices removable and also usable with the backhoe in such manner as to not impede the normal operation of the backhoe.

Another object of the instant invention is to provide a roller attachment for a backhoe which obviates the necessity or temptation of using the rear face of the backhoe itself as a tamping or ramming device in the backfilling operation.

Another object of the invention is to provide a device usable in conjunction with a backhoe which greatly improves the capacity for filling and tamping trench works and excavations initially effected by the backhoe.

An object of the invention is to provide a tamping device for use in association with a backhoe which is usable in either dry soil or silty soil conditions. In the former case, a sheep's foot configuration is employed with cleaning means associated with the sheep's foot projections. In the latter instance, the cleaning attachment may be removed for use of a rolling means which is more continuous in its application to the surface to be rolled.

Another object of the invention is to provide a rolling device adapted to be used in conjunction with backhoes of sizes ranging from the smallest to the largest width backhoe device, but the same style or construction of rolling device may be used with greater or lesser width backhoes.

Another object of the invention is to provide rolling means and compacting devices for use in association with backhoes which will operate to pack the edges of trenches and excavations to be filled and, additionally, will handle tapered cross section ditches.

Another object of the invention is to provide means and devices which may be used in association particularly with hydraulic backhoes which may cure some of the objectionable uses to which the said hydraulic backhoes have been applied. That is, since operators of the conventional backhoes have been prone to use same in compacting operations in digging and refilling, the means provided permit the carrying out of such desired additional actions and activities without damage to the backhoe or the fittings thereof.

Another object of the invention is to provide rolling means and devices for compacting soil in excavations made by backhoe devices including holes, trenches and excavations of all types.

Another object of the invention is a device which is readily and removable attachable to a backhoe which will operate to completely and fully tamp the backfill into a trench or excavation in successive stages as the filling operation proceeds, the device working across the entire width of a conventionally sized trench.

Another object of the invention is to provide attachable means to a hydraulic backhoe whereby the backhoe will not
only dig the trench and backfill same, but also roll in such manner that one machine accomplishes the results of a digging machine, backfilling machine, air tampers and vibrators.

Another object of the invention is to provide means attachable to a backhoe construction which can adequately tamp overdug trenches because the backhoe-carrying vehicle may be tilted and the attachment will reach wherever the backhoe would reach, indeed further.

An object of the invention is to provide a device to be used in the backfilling of excavation and trenches which adds versatility to the backhoe itself, because, as an attachment thereto, it comprises a considerable extension of length thereto and thus gives greater versatility in handling the backfilled and filling soil to compact same.

Other and further objects of the invention will appear in the course of the following description thereof.

In the drawing, which form a part of the instant specification and are to be read in conjunction therewith, embodiments of the invention are shown and, in the various view, like numerals are employed to indicate like parts.

FIG. 1 is a side view of a part of the mechanism of a backhoe with the improvement or attachment mounted thereon.

FIG. 2 is an end view of the roller attachment for the backhoe of FIG. 1. Looking upwardly in the view of FIG. 1. FIG. 3 is a view of the other end of the roller for the backhoes, that is looking downwardly in the views of FIGS. 1 and 2.

FIG. 4 is a view taken along the lines 4-4 of FIG. 2 in the direction of the arrows.

FIG. 5 is a view taken along the lines 5-5 of FIG. 2 in the direction of the arrows.

FIG. 6 is a view taken along the lines 6-6 of FIG. 2 in the direction of the arrows.

FIG. 7 is a fragmentary side view of a silt-type roller mounted on the frame of the sheep's foot roller shown.

FIG. 8 is a detail of one of the feet of the sheep's foot roller.

Referring first to FIG. 1, in the upper portion of this view is shown a diagram of a typical and conventional backhoe. Thus, first bucket-supporting arm 10 is pivotally attached at one end and 10a thereof to a vehicle or a portion of a vehicle such as the rear end of a tractor. A hydraulic or pneumatic cylinder 11 is attached at its inner end 11a to the frame of a tractor or vehicle and operates so as to extend and retract piston rod 12. A second bucket-supporting arm 13 is pivotally attached at one end thereof to arm 10 within bracket or frame 14 and is pivotally attached to its other end to bucket 15 at 13a. Bucket 15 opens upwardly in the view of FIG. 1. A second hydraulic or pneumatic cylinder 16 is attached at 17 to bracket or frame 14 and operates to extend and withdraw piston rod 18. Piston rods 12 and 18, in the view of FIG. 1, are both shown in fully extended position. This puts the bucket 15 in the raised, curled position typical of a full digging stroke. At this position, typically, the bucket would be full of dirt immediately prior to being dumped before scooping another load.

Frame members or arms 19 and 20 are each attached at one end to the end of piston rod 18 at 18a. Arm 19 connects at 19a to arm 13, while arm 20 connects at 20a to one side or the top side (in digging position) of bucket 15. The cutting edge or digging edge of bucket 15 is seen at 15a. The attachments of arm 13 at 13a and arm 20 at 20a to bucket 15 is between a pair of opposed parallel flanges 21.

All of the previously described structure is that of a conventional backhoe. The structure of the arms, the relative relationships of the arms to one another, the connections of the hydraulic or pneumatic pistons to the vehicle and to the frame and to the various arms may be varied in numerous manners, but that shown is very typical for a relatively smaller backhoe class.

In a larger backhoe, there would be a larger and more complex carrying-arm attachment to the tractor or vehicle with an additional set of hydraulic pistons provided for manipulating such carrying arm.

It is understood that it is known to the art that numerous attachments may be made to the backhoe frame other than the bucket, such as compacting or impacting devices of the character of spring-mounted plates, hydraulically operated hammers of the like. The instant invention could be employed in connection with another attachment to the backhoe arms other than a digging bucket, but the use in conjunction therewith is by far the most practical.

Turning, then, to the improvement, there is attached to the lower side of bucket 15, side 15b in FIG. 1, spaced from flange 21, a pair of plates 22 and 23, which are mounted by suitable bolts to said wall 15b. These latter bolts are indicated at 22a and 23a. Attached to plates 22 and 23 are a pair of hooklike members 24 and 25. Plates 22 and 23 and hook arms or plates 24 and 25 are not normally carried with the operating bucket of the backhoe and are only applied immediately prior to attachment of the roller to the instant invention to the bucket.

Turning to the roller itself, a baseplate 26 having end flanges 26a and 26b has attached to the upward side thereof in the end thereof (view of FIG. 1) shaft 28, the latter being internally threaded at each end thereof to receive bolt 29 therein thereby to engage shaft or bar 28 between paired flanges 21.

Two pairs of ears 30 and 31 are connected to the upper side (FIG. 1 view) of plate 26, each pair carrying pins or shafts 32 and 33 therein whereby to be engaged by hook members 24 and 25 in the manner seen in FIG. 6 when the device is to be attached to the bucket of the backhoe.

A pair of main mounting plates 35 and 36 are connected at their upper ends (FIG. 1 view) to plate 26 and flanges 26a and b in rigid manner. Also attached to plate 26, on the downward side thereof (FIG. 1 view) is baseplate 37 carrying a plurality of cleaning blades or flanges 38 thereon, the latter extending outwardly in spaced relationship to one another at right angles to plate 37. The latter is removable fastened by bolts 39 to plate 26.

Referring to FIGS. 2, 4, and 5, a pair of collars 39a and 39b are fixedly received in sideplates 35 and 36, respectively. An elongate shaft 40 is removably fixed by pins 41a and 41b into said collars 37 and 38. Bearings 42 and 43 are positioned inwardly of collars 37 and 38 on said shaft 39. A barrel is mounted on said shaft 39. A barrel is mounted on said shaft and comprises a cylindrical wall 44 having end members 45 and 46 fixed inwardly of the ends thereof. Bearings 42 and 43 are fixed to barrel flanges 45 and 46 and the bearing barrel rotate on shaft 39. Collars 37 and 38 are welded to sideplates 36 and 37. Alternatively, bearings may be removably bolted on plates 35 and 36 and extending inwardly thereof toward flanges 45 and 46 to ease removal of the roller barrel. End members 45 and 46 have openings 47 and 48 centrally therethrough. Fixed on the outer surface of the wall 44 are a plurality of regularly arranged and spaced sheeps foot or legs 49. These are so spaced and arranged on the drum or wall 44 that plates 38 pass therebetweeen to clean same as the drum rotates on the shaft 39. FIG. 8 shows a preferred form detail of the sheep's foot 49 or legs of the roller with a thickened base portion 49a and a lesser diameter bearing portion 49b.

The structure of FIG. 7 shows the use of a shaft construction which mounts a plurality of rubber-tired wheels 55 mounted centrally on rims 56. The wheels are crowned next to one another on the shaft 39 with only such bearings therebetween as to give some spacing of a minimum friction-reducing character between the individual rubber tires 55 whereby a dirt-rolling means is achieved without substantial gaps between the surfaces contacting the dirt either longitudinally of the shaft or radially around the axle. In order to use this type of a dirt-rolling device, the cleaning plates 38 must be removed from the baseplate 26.

In use of the device, shafts 32 and 33 are set into the hooked members 24 and 25 for engagement as is seen in FIG. 2. Beam 27 is positioned so that bar member 28 is positioned between flanges 21 and bolts 29 are threaded through flanges 21 (the
openings 29 thereof) whereby to make a complete engagement. The rigid beam 27--bolt 29 engagement holds the shafts 32 and 33 in the hook members 24 and 25. It should be noted that flanges 21 conventionally have a pair of openings adjacent the end thereof shown for alternate mounting of arm 20. The utilization of the front or down openings in the view of FIG. 1 permits attachment of the device without changing of the commercially provided backhoe.

Once the device is attached, as seen, it is assumed that the backfilling and compacting job is to be commenced. The dirt may be moved back into the excavation by a front blade, a bucket or other means on the other end of the tractor, if the vehicle involved is a tractor, or a separate vehicle with separate means. However, it well may be more convenient and quicker to drag the piled dirt back into the trench by the backhoe with roller attached and roll simultaneously with dirt return. On the back-roll stroke the bucket opens up for another grab of dirt from adjacent the trench. Thereafter, with the arms 10 and 13 starting essentially from the position seen in FIG. 1, the roller device may be used to compact the soil down into a trench or other excavation to the degree desired, then another load of dirt put into the excavation, the same rolled, etc. In the event there is a silt base involved, the roller of FIG. 7 is employed, but attached in the same way as seen in FIG. 1. Plates 38 are removed with their baseplate 37 by removing bolts 39. When the backfilling job is completed, the roller may be detached by first removing bolts 29 and then disengaging the shafts 32 and 33 from the hook members 24 and 25.

One of the purposes of the instant device is that, if the operator puts the fill back into the hole, he may compact the fill. The fill may be pushed in by other vehicles or the front loader if the hoe is attached to the rear end of a vehicle carrying such a loader.

With the present attachment, one can roll with the backhoe at a maximum depth. If the trench is not too sloped, the vehicle may straddle the trench in order to permit rolling straight down the line of the bottom of the trench.

The operator of the instant device may use such with the bucket reversed, but it is not as good. That is, the operator can tamp with the bucket reversed or not.

In backfilling, one typically starts at the end of the trench that the pipe layers start laying pipe. One builds one’s own road on which to work as the trench is filled in if the vehicle can’t straddle the trench because of excessive width.

In the case one digs with trencher across a drive to produce a trench only 10 inches wide, then, one may take the backhoe to trim the trench to a sufficient size so one can use the roller to tamp the backfill.

The device will be detached while digging so as not to carry the weight. It is easy to remove as there is only one pin to be removed.

In digging in soil around rock or concrete the operator may remove the attachment ears.

The operator may carry the device in the front bucket to the job site or attach it to the backhoe, (rotate bucket 90° clockwise in FIG. 1) or carry it in the backhoe bucket in the position of FIG. 1.

The cleaners are on a plate which is bolted to the inside face of the frontplate so same are removable for application of a silt-type roller.

To remove the barrel from the side mountings, pull the pins 41 and 42, drive out the shaft and the notches in each side of the barrel rim the size of the collar permits removal.

FIG. 7 shows a device which will permit rolling silt without tearing the top of the silt up. The other device (the sheep’s foot roller) would do this, but the top would be torn up, that is, would compress the lower portion of the silt but tear up the top. In the silt roller, the wheel diameter would range from 18 inches to 10 inches and the wheels would be considered to have a bearing inside themselves.

Referring to the sheep’s foot roller of the other figures, in a dry condition of the soil, one can employ more teeth. On the other hand, in wet-soil conditions, an excess of teeth will plug the roller despite the presence of the cleaning devices.

In use of a bucket drophammer, there is a limited stroke (must fill ditch to tamp) and in a slope trench it is almost impossible to use.

90 percent of what has been dug must be returned to the excavation.

From the foregoing, it will be seen that this invention is one well adapted to attain all of the ends and objects hereinabove set forth together with other advantages which are obvious and which are inherent to the structure.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of the claims.

As many possible embodiments may be made of the invention without departing from the scope thereof, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim:

1. In a backhoe construction in which a digging bucket is supported from a vehicle by at least a pair of linked arm members, with at least a pair of power pistons associated with said vehicle and arms whereby to manipulate the latter and the bucket for digging and filling purposes, the improvements which comprise:

- mounting means positioned on the back side of the digging bucket to removably receive and removably attach roller means, said mounting means positioned within the lateral extension of said digging bucket so as not to extend outwardly laterally thereof,
- roller means removably attached to said mounting means on the back side of said digging bucket so that, when the open face of the bucket is facing to some degree upward, the roller means may be employed to roll and compact earth,
- the effective rolling width of the roller means no greater than the digging bucket width, whereby the roller and the means for mounting and attaching same to the back side of the digging bucket are positioned inside of the lateral extension of the digging bucket, thereby to be usable in rolling dirt within a trench dug by said bucket.

2. A device as in claim 1 wherein the roller is of the sheep’s foot type and sheep’s-foot-roller-cleaning means, comprising a plurality of plates fixed to the back side of said digging bucket, extend between the rows of sheep’s foot members on rotation of said sheep’s foot roller.

3. A device as in claim 1 wherein the roller means is of the silt-rolling type with substantially continuous rolling surfaces across the width of the rolling means.