ABSTRACT: A tethering device for a self-propelled lawn mower which includes a circular reel base normally resting in flat stationary position on the ground and having a pair of upstanding winding stakes spaced apart from the central axis of the base, with a tether cord wound in loop formation about the stakes. The outer or free end of the cord is connected to the mowing machine for guiding the machine. In operation, the self-propelled tethered mower describes a generally spiral cutting path or swath as it circles about the flat stationary base and unwinds the cord from the spaced winding stakes.

The circular base further includes a bearing sleeve located at its central axis, combined with a detachable handle having an angular limb or section arranged to be inserted into the bearing sleeve. The handle acts as a lever, permitting the circular base to be upended from its flat anchorage position to a vertical position resting upon its circular rim for rolling the circular base to a new location. The tether cord, which is disconnected from the mower, is reeled back upon the winding stakes automatically as a result of the rolling action. After the base is rolled to its new location with the tether cord reeled in, it is turned back to its flat position and the mowing machine is again connected to the free end of the tether cord for repeating the spiral mowing cycle at the new location.
TETHERING DEVICE FOR SELF-PROPELLED MACHINES

BACKGROUND OF THE INVENTION

The concept of mowing lawns or otherwise treating land areas in an automatic manner by tethering the mower to a fixed object such as a tree or post, or by suitable stakes driven into the ground has been known in the past. In such arrangements, the path of the self-propelled lawnmower is controlled by paying out or reeling in the tether cord which has its free end connected to the mower. The length of cord which is wound or unwound as the mower makes one circuit about the anchorage device is approximately spiral as the mower recedes from or approaches its anchorage point.

While such arrangements eliminate much of the effort of hand mowing an area; nevertheless, considerable time and effort is involved in detaching the tether cord from the fixed anchorage point and rewinding it about another fixed anchorage point for the next cutting cycle. Moreover, the use of the fixed tether or anchor point does not provide the flexibility which may be necessary in cutting areas in a lawn which include obstructions such as trees, bushes or buildings, making it necessary to hand mow a considerable portion of the area which cannot be reached by the tethered mower.

One of the primary objectives of the invention has been to provide a movable reel for the tether cord for a lawnmower or other machine in which the reel may be rolled from one location to another as desired, and in which the reel automatically rewinds the tether cord for the next mowing cycle as a result of being rolled to its new location.

According to this concept, there is provided a circular base normally resting on the ground in flat stationary position and provided with two or more upstanding, spaced prongs or winding stakes, one end of the tethered cord being permanently anchored to one of the stakes. At the start of the mowing cycle, the self-propelled mower is positioned adjacent the flat stationary base and is connected to the free end of the tether cord which is reeled in loop formation upon the spaced upright stakes. The self-propelled mower is then started in a direction to unwind the looped tether cord from the stakes.

The length of cord unwound from the stakes as the mower makes one circuit about the base is somewhat less than the width of the cutting path or swath cut by the mower, whereby the path of the mower becomes an approximate spiral with the cutting path overlapping slightly on each pass of the mower. The tether cord is reeled in as the circular base is erected to an upright position and rolled to a new location.

A further objective has been to provide a convertible tethering device having a circular base with a detachable handle which forms a lever in erecting the base from its flat position to its reeled-in position without a great deal of effort.

For this purpose, the circular base includes at its central axis a bearing sleeve, the winding stakes being located at opposite sides of the sleeve. In order to form a lifting lever, the detachable handle is generally U-shaped, having an elongated shank which provides the lever action, and having at one end of the shank an angular bearing leg or section which is inserted into the centralized bearing sleeve. A handgrip section projects in the same direction as the bearing section at the opposite end of the shank. This arrangement permits insertion of the bearing section of the detachable handle into the bearing sleeve of the base, utilizing the shank as a lever in erecting the handle. Facilitate reeling in the cord, the handle is used to guide the erected rolling base and the outer end of the cord is provided with a snap catch which establishes the connection with the forward end portion of the mower.

At the end of the cutting cycle, the mower is stopped, the snap catch is disconnected from it, then the cord is slipped into a helical eylet forming a part of the handgrip section of the detachable handle. Thus, as the operator pushes the circular base forwardly with the detachable handle, the cord is reeled in about the winding stakes by the guiding action of the eylet until the outer end of the cord approaches the eylet. At this point, the cord may be disengaged from the eylet, the circular base returned to its flat position, again using the detachable handle as a lever, then the handle is removed and the lawnmower is moved up to the base and connected to the tether cord by the snap catch to repeat the cutting cycle at the new location.

A further objective has been to provide a convenient means for increasing or decreasing the width of the spiral cutting swath so as to adapt the tethering device to different sizes of mowing machines, with the cut overlapping slightly on each pass, as noted earlier.

In order to carry out this function, there is provided a pair of removable bushings which may be fitted upon the winding stakes and locked in place by set screws. By operation of the bushings, the length of each cord loop reeled about the stakes is increased, whereby the use of two bushings provides a swath of maximum width. If an intermediate width is desired, then a bushing may be applied to one of the stakes only.

One of the advantages of utilizing the winding stakes arises from the fact that the path of motion of the mower from the normally increasing radius to a diminishing radius can be carried out simply bylooping the cord over one of the stakes when the mower reaches a desired circumference. This causes the mower, while continuing to move in the same direction, to wind itself back upon the stakes. By this action, the mower picks up the cuttings and discharges them inwardly toward the circular base. This action is also used to limit the radius of the cut as the mower approaches an obstruction such as a tree, building or the like.

The tethering device is of simple rugged design, does not involve the use of moving parts, except for the detachable handle, and is conveniently moved about without a great deal of effort. The various features and advantages of the invention will be more apparent from the following detailed description in conjunction with the drawings.

DRAWINGS

FIG. 1 is a perspective view showing the tethering device with the circular base upended and resting upon its rim, with the detachable handle in place, the assembly being pushed forwardly in a clockwise direction to reel in the tethering cord at completion of a mowing operation.

FIG. 2 is a top plan view, showing the base in its flat position upon the ground and showing diagrammatically a self-propelled mowing machine tethered to the cord and traveling in the clockwise direction such that the mowing machine travels around the base outwardly, to mow a generally spiral swath, the edges of which overlap one another as the cord is paid out from the base, as indicated by the arrow.

FIG. 3 is a perspective view showing the base in its flat position upon the ground with the detachable handle inserted into the central sleeve, whereby the handle is used as a lever to erect the base to its reel-in position, as indicated by the broken lines.

FIG. 4 is an enlarged plan view, generally similar to FIG. 2, further illustrating the base and cord of the tethering unit.

FIG. 5 is an enlarged sectional view taken along the line 5--5 of FIG. 4, detailing the base of the tethering unit.

FIG. 6 is a fragmentary side view projected from FIG. 5, showing the arrangement of slots and lugs by means of which the adjoining ends of the steel band, which forms the rim of the base, are connected together by crimping.

FIG. 7 is a fragmentary top plan view projected from FIG. 6, further illustrating the crimping arrangement of the steel band or rim.

FIG. 8 is a top plan view of the base, similar to FIG. 4, illustrating the cord crossed over the right-hand stake so that the cord and mower will be reeled in toward the base while traveling in the same clockwise direction.

FIG. 9 is a fragmentary perspective view showing a portion of the handle and the open helical eylet which guides the cord as it is reeled in, as indicated in FIG. 1.
FIG. 10 is a fragmentary view illustrating the snap catch which is used for anchoring the free end of the tethering cord to the mowing machine.

FIG. 11 is a fragmentary sectional view similar to FIG. 5 showing a modified arrangement in which a detachable bushing is applied to one of the winding stabs to increase the radius of the spiral cutting path.

GENERAL ARRANGEMENT AND OPERATION

As shown generally in FIG. 2, the tethering unit comprises the circular base indicated generally at 1 which rests upon the ground to provide an anchorage for the self-propelled lawn mower, which is indicated generally at 2. The mower 2 is shown diagrammatically and may represent any commercial power-driven machine, preferably of the rotary type powered by an engine 3 and supported upon drive wheels 4 and idler wheels 5. The power wheels 4 are in driving connection with the engine 3 for advancing the mower in its generally spiral path as controlled by the tether cord 6, the outer end of which is anchored as at 7 to the forward portion of the mowing machine for steering the mower. The self-propelled mower is provided with the usual discharge chute 8 and includes a handle 10 permitting the machine to be used in the conventional manner.

The circular base 1 is manipulated by a detachable handle 11, as indicated generally in FIGS. 1 and 3. The handle 11 is generally U-shaped and one of its limbs may be slipped into a central bearing sleeve 12 projecting from one side of the base 1. The base 1 further includes a pair of reel stakes 13–13 preferably tubular, located on opposite sides of the bearing sleeve 12. As shown generally in FIG. 3, the handle 11 is used as a lever to exert the base 1 from the flat anchorage position shown, to its vertical or rolling position (FIG. 1) for use in reeling in the cord 6.

As shown in FIG. 3 with one limb of the handle 11 inserted within the bearing sleeve 12, the circular base (which may weigh in the neighborhood of 80 pounds) may be erected to its rolling position without a great deal of effort by grasping the outer end portion of the handle and pulling upward. Initially, a lift of approximately 20 pounds at the end portion of the handle is sufficient to start reeling the base and this force diminishes rapidly as the base approaches its vertical wheel position.

After the base 1 has been erected upon its rim, the handle 11 is used for pushing the circular base or wheel 1 and for guiding it (FIG. 1). The relationship is similar to that of a wheelbarrow but there is no load imposed upon the handle except that which may be required to push the wheel. During the reel-in operation, the anchor 7 of cord 6 is disconnected from the mowing machine and the cord is looped through an open helical eyelet 14 (FIG. 1) to guide the cord upon the stakes 13–13 upon which it is reeled. After the cord is reeled in, and with the base or wheel 1 pushed to a new location, the lawn mower 2 may be again anchored to the end of the tether cord to repeat the mowing cycle.

Generally speaking (FIG. 2) the lawn mower 2 circles about the base 1 in a clockwise direction, as indicated by the arrow, and describes a generally spiral path receding from base 1, the spacing of the stakes 13–13 being such that the outer spiral swath overlaps by 3 or 4 inches the previously cut swath as the cord 6 is paid out from base 1. The discharge chute 8 (FIG. 1) is arranged to discharge the cuttings inwardly, as indicated by the arrow (FIG. 1) as the cut proceeds outwardly to the limit of its radius.

As shown in FIG. 1, the cord 6 is anchored as at 7 near the forward edge of the mower near the axis of its idler wheels 5. By virtue of this arrangement, the tethering effect of cord 6 guides the mower in its spiral path, bearing in mind that the mower normally tends to move to a straight line. If the cord is anchored at or near a midpoint between the wheels 4 and 5, it has been found that the mower does not steer properly but may deviate from the spiral path by failure to respond to the tethering action of cord 6.

The spiral cutting path or swath is indicated at 15 by the broken lines in FIG. 1. In order to provide a clean cut the mower travels in its increasing spiral path, the newly cut swath overlaps the earlier one by several inches as indicated at 16 in FIG. 2.

It will be understood that the width of swath or cutting path 15 will vary according to the size of the lawn mower, a mower of small or intermediate size being indicated in FIG. 1. If the mower cuts a wider path 15, then the spiral path may be increased in radius by the use of tubes or sleeves, indicated generally at 17 in FIG. 11, which are slipped upon the stakes 13–13, as explained later.

If desired, the direction of the spiral can be reversed by lifting the cord over one of the stakes 13, as shown in FIG. 8 to limit the area which is mowed. In this event, the mower continues cutting in the same direction but spirals inwardly toward the base as the cord is reeled in with reference to the stakes 13–13. This causes the cuttings, previously discharged, to be gathered by the mower and successively swept inwardly toward the base, as the cord reels the mower in its spiral path inwardly.

STRUCTURAL DETAILS

As best shown in FIG. 5, the circular base 1, which, in the present instance is formed of concrete, includes a rim 18 preferably formed of steel encircling the periphery of the base. In order to facilitate packaging and shipping, the rim may be in the form of a flat strip of sheet metal which is bent to its circular shape when the concrete base is to be poured into the rim. In the present example, (FIGS. 6 and 7) one end portion of rim 18 includes narrow slots 20, spaced apart from one another and the opposite end of the metal band includes a series of lugs 21 which interfit the slots 20.

Upon assembly, the sheet metal band is bent to its circular formation and the lugs 21, which project at right angles from the end of the band, are inserted through the slots 20, as indicated by the broken lines 22 in FIG. 7. In order to facilitate assembly, the lugs 21 may be tapered longitudinally toward their outer ends. After being inserted through the slots 20, the lugs 21 are bent downwardly (FIG. 7) so as to clasp the free ends of the band in its circular formation.

After the rim is set up the tubular bearing sleeve 12 is located at the central axis of the rim 18 in a perpendicular position. The stakes 13–13 are next located at equidistant centers in line with and on opposite sides of the bearing sleeve. Thereafter, the concrete is poured into the circular rim 18 flush with its upper and lower edges so as to embed the bearing sleeve 12 and tubular stakes 13–13 within the circular concrete slab, as shown in FIG. 5.

The lower ends of the bearing sleeve 12 and stakes 13–13 preferably extend through the concrete slab to its lower edge, which is substantially flush with the lower edge of rim 18. In order to aid in anchoring base 1 to the ground, the lower edge of the concrete slab may include a circular flange 23 having downwardly tapering sides arranged to be embedded in the ground as indicated by the broken line 24 (FIG. 5).

In order to locate the bearing sleeve 12 centrally of the rim 18 and the stakes 13–13 with reference to bearing sleeve 12, a suitable fixture (not shown) is utilized. The fixture may constitute a base plate having a groove for forming the flange 23 and for mounting the circular rim 18. In addition, the base of the fixture may include a central stud for locating the bearing sleeve 12, with suitable means for holding the stakes 13–13 in spaced relationship to the sleeve 12. The concrete is poured within the rim 18, as noted above, and after the concrete sets, the assembled base is removed from the fixture and is ready for use.

The circular base may be formed from materials other than concrete although the concrete structure is more practical to fabricate and is sufficiently heavy for the intended purpose.

A circular base having a diameter of 20 inches and a thickness of approximately 3¼ inches provides a weight load of approxi-
mately 80 pounds, as noted earlier. If the base is to be rolled across paved surfaces which may include pebbles or roughness, a resilient tread (not shown) may be applied to the outer periphery of rim 18.

The detachable handle 11 may be of tubular construction and is generally U-shaped, as shown in FIGS. 1 and 3, comprising a shank 25 having a handgrip section 26 at one end and a bearing section 27 at the opposite end of the shank. In order to provide clearance for inserting the bearing section 27 into the bearing sleeve 12, the shank 25 slants upwardly from bearing section 27 at an angle greater than a right angle. The upward slope of the shank provides ground clearance for the end of handgrip section 26, the length of which is greater than the bearing section 27. The handle 11 is formed by a bending operation, with curved portions joining the sections 26 and 27 to the shank 25.

To facilitate insertion of bearing section 27 into bearing sleeve 12, clearance is provided between the two parts and the outer end portion of bearing section 27 is tapered as at 28 (FIG. 5). A stop collar 30 (FIGS. 3 and 5) is secured to the outer end of bearing section 27 by welding or other means (not shown). The stop collar 30 abuts the outer end of bearing sleeve 12 to limit the extent of insertion of the bearing section 27 into sleeve 12. It will be noted in FIG. 5 that the upward slope of shank 25 provides adequate clearance between the shank and the outer ends of the winding stakes 13–13.

The handgrip section 26 preferably is parallel with the bearing section 27 and is somewhat longer, as provided by the slope of shank 25. The arrangement is such that the handgrip section 26 is approximately centered with respect to the erected base or roller 1 to facilitate handling the roller. The handgrip section 26 preferably includes a pair of handgrips 31–31 (FIG. 1) spaced apart sufficiently to suit the user.

The helical eyelet 14 which is secured to the handgrip sec-

section 26 (FIGS. 1 and 6) comprises a screw threaded shank portion 32 passing through the threaded hole formed in the handgrip section. The upper end of the shank is locked in position by a nut 33 engaging the handgrip section. The eyelet 14, as noted, is of helical formation providing an open slot 34 permitting the cord 6 to be dropped through slot 34 in order to engage or disengage the cord relative to the eyelet in a convenient manner. This arrangement makes it unnecessary to draw the end of the cord through the eyelet as the cord is disconnected to the machine 2 for the mowing operation.

As best shown in FIG. 3, one end of the cord 6 is looped as at 35 about the reel or winding stake 13 to provide a permanent connection. The cord may be fabricated from the woven nylon or a similar flexible material having sufficient tensile strength to tether the mower 2 without undue wear.

The outer end of the cord has a similar loop 36 (FIG. 10) anchored to a snap catch 37 which provides a connection to the mowing machine. The snap catch 37 is a commercially available device comprising, in general, a swiveled stirrup 38 to which the cord is anchored. The stirrup is swiveled to a rigid hook 40 and a flat spring 41 has one end anchored to the base portion of hook 40, with its outer free end engaged against the inner surface of hook 40.

The snap provides a connection with an eyelet, previously indicated at 7, which is attached to the forward end of mower 2 as explained earlier.

At completion of the mowing operation, the snap catch 37 is disengaged from the mower eyelet 7, the handle 11 is inserted in the bearing sleeve and the end portion of cord 6 is looped through the helical eyelet 14. The erected circular base 1 is then wheeled to a new location, at the same time reel-

ising in the cord 6 as explained earlier. On the other hand, if it is desired to cause the mower 2 to be rewound to collect the grass cuttings, the base 1 is left in its flat position and the cord 6 is looped over one of the winding stakes 12 (FIG. 8) causing the mower to continue operation in the same direction by spiralling inwardly at a diminishing radius toward the base so as to collect the cuttings and accumulate them about the base, as described earlier.

In the event that it is desired to increase the width of the swath 15, for example if a larger lawnmower is to be used, then the dimension across the winding stakes 13 may be increased by applying the bushings 17 to the winding stakes 13. Each tube 17 has a bore permitting it to be slipped upon the upstanding stakes 13 and each tube includes a set screw 42 securing it in position upon the stake. The tubes 17 can be used singly or in pairs to increase the length of the loop of the cord about the stakes 13–13 as the cord is wound or unwound.

Having described my invention I claim:

1. A tethering device for guiding the path of motion of a self-propelled mowing machine or similar machine comprising:

   a. a convertible base having a circular periphery;
   b. said circular convertible base normally resting in a flat stai-
     onary position on the ground;
   c. said circular base having a sufficient diameter and thickness
      and formed of a material providing for a weight load capable of
      tethering the said self-propelled mowing machine when resting
      in said flat position on the ground;
   d. a plurality of winding elements forming a reel and projecting
      upwardly from said base when the base is disposed in said
      flat stationary position on the ground;
   e. a tether cord having one end anchored to one of said winding
      elements;
   f. said tether cord normally wound about said winding ele-
      ments at the start of a mowing operation;
   g. said tether cord having a free outer end arranged to be
detachably connected to the self-propelled mowing machine,
whereby the mowing machine is guided by the tether cord in a
generally spiral cutting path receding outwardly from the flat
stationary base as it circles about the base and unwinds the
tether cord from the winding elements;
   h. a bearing element located at the central axis of said circular
      base;
   i. a detachable handle having a shank of sufficient length to
      provide a lever and having an end portion projecting at an
      angle from the shank and forming a bearing element inter-
      fering the bearing element of the circular base;
   j. said circular base arranged to be erected by said handle
      from said flat stationary position to a position resting upon
      the circular periphery and rolled to a selected location, upon in-
      terferring the said bearing elements of the handle and base,
thereby converting the stationary base to a movable winding
reel;
   k. said tether cord adapted to be disconnected from the mow-
      ing machine at the end of a given mowing cycle and said cir-
      cular base being erected and rolled to said new location,
whereby the tether cord is rewound upon said winding elements
as a consequence of the rolling motion of the erected circular
base to said new location for repeating the mowing cycle.

2. A tethering device as set forth in claim 1 in which the
winding elements, which project upwardly from the circular
base, comprise at least two winding stakes spaced apart from
one another on opposite sides of the bearing element at the
central axis of the circular base and in which the tether
cord is normally wound in loop formation about said stakes.

3. A tethering device as set forth in claim 1 in which the
winding elements comprise a plurality of winding stakes
spaced apart from one another about the bearing element at
the central axis of the circular base and in which the tether
cord, which is looped about the said stakes, is crossed over
one of said stakes, thereby causing the tether cord to be
rewound upon the stakes while the mowing machine continues
its motion in the same direction about the flat stationary base
in a reversed spiral path approaching the base.

4. A tethering device as set forth in claim 1 in which a bear-
ing element of the circular base comprises a bearing sleeve
located at the central axis of rotation of the base, said winding
elements comprising a plurality of stakes projecting upwardly
and spaced outwardly from the bearing sleeve, the bearing ele-


7. A device for guiding a tether or shank on a base, comprising a handle for guiding a tether cord upon the base, whereby said elongated shank provides a lever for raising the base from the flat stationary position to a position resting upon the circular periphery thereof when the bearing portion is inserted into the bearing sleeve, the opposite end of said shank including a handgrip section extending angularly with respect to the shank for guiding the erected base during the rolling motion thereof as said tether cord is rewound.

8. A tethering device as set forth in claim 4 in which the handle is generally U-shaped having an elongated shank including a bearing portion extending angularly with respect to one end of the shank and interfitting the said bearing sleeve of the base, the opposite end of the shank having a handgrip section extending angularly with respect to the shank in the same direction as the bearing section for guiding the erected base during the rolling motion thereof, and an eyelet projecting from the handgrip section, said tether cord passing through said eyelet and guided by the eyelet upon the winding stakes for guiding the tether cord upon the stakes for rewinding the cord as the base is rolled to a new location.