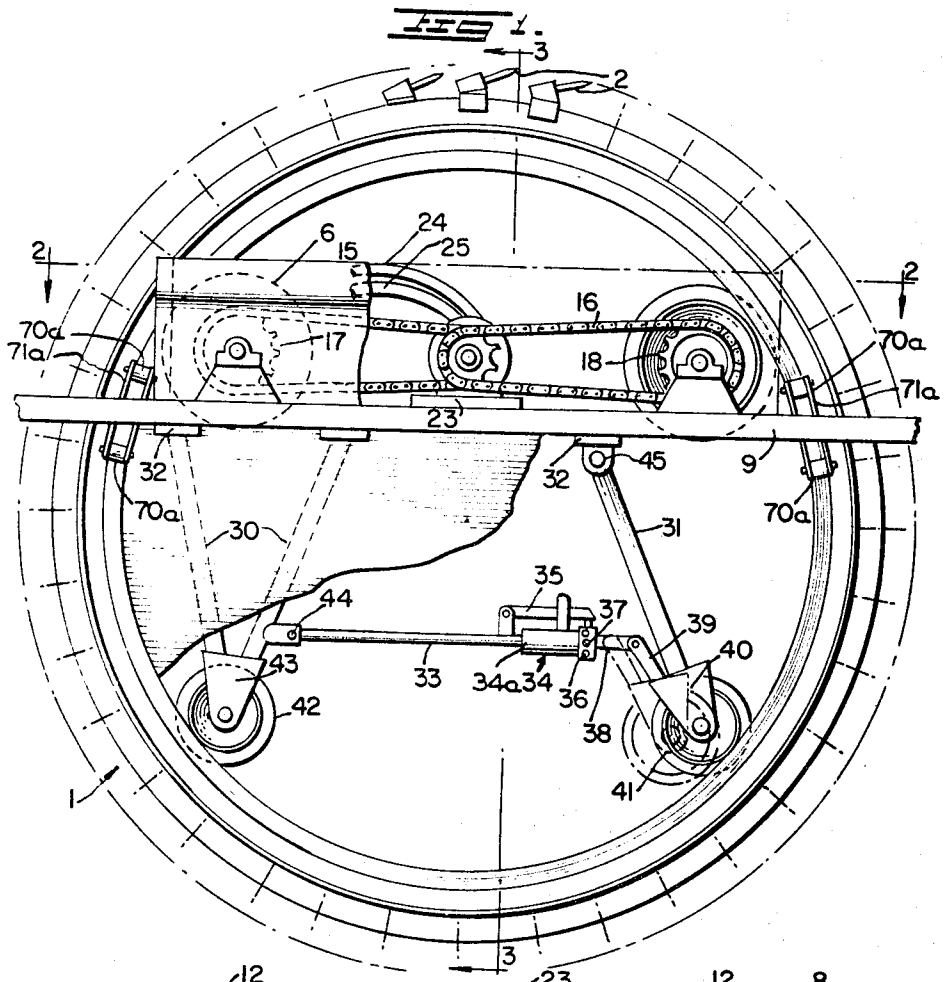
Nov. 26, 1968 F. M. REISING 3,412,490

TRENCHING MACHINE

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FIG 1.



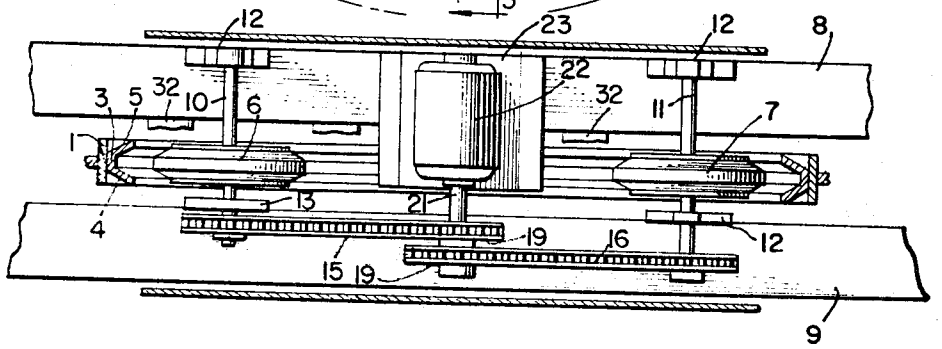


FIG 2.

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Fig 3.

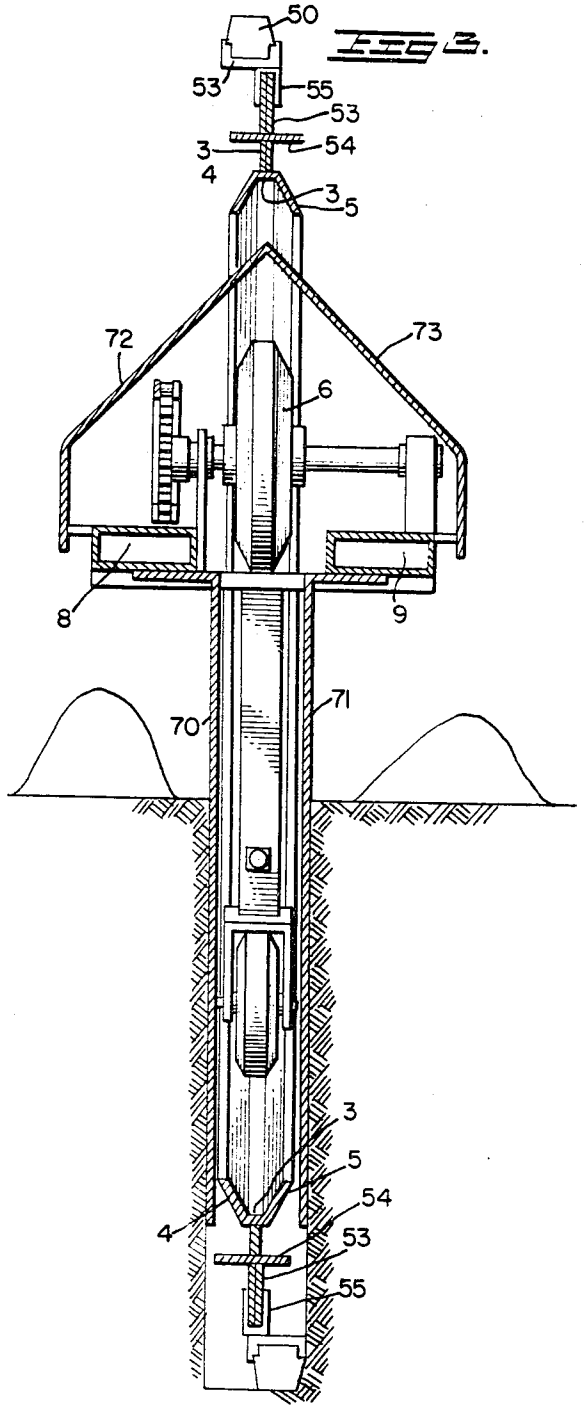
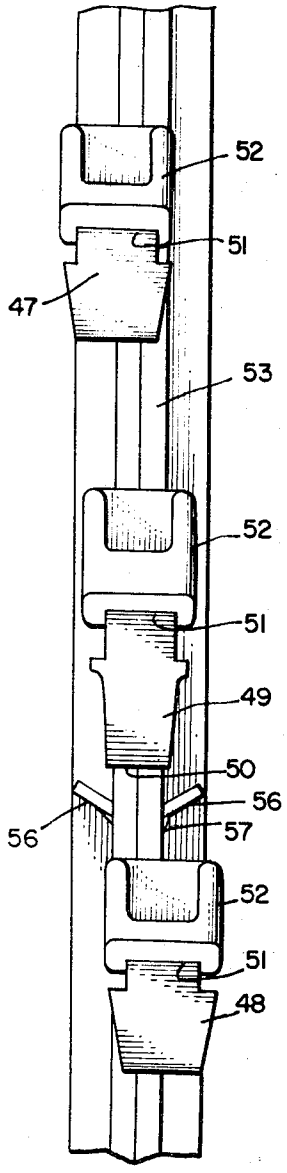


Fig 4.



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TRENCHING MACHINE

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Fig 5.

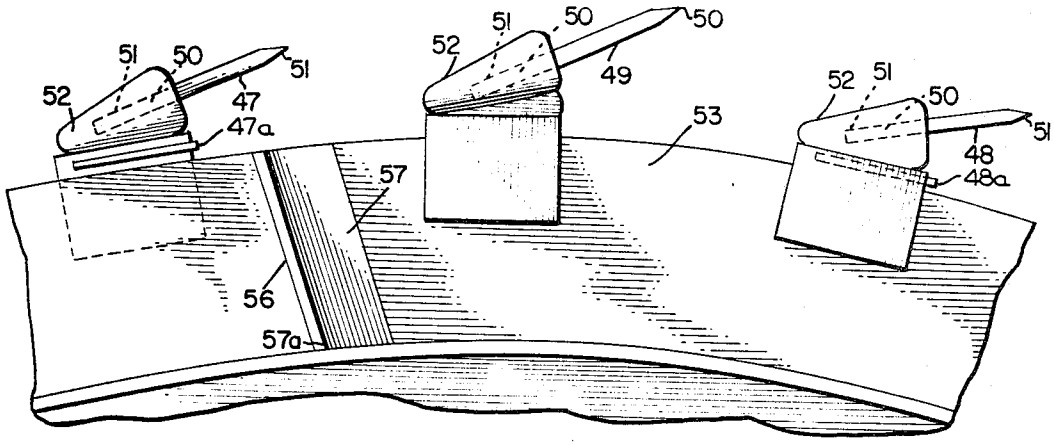


Fig 6.

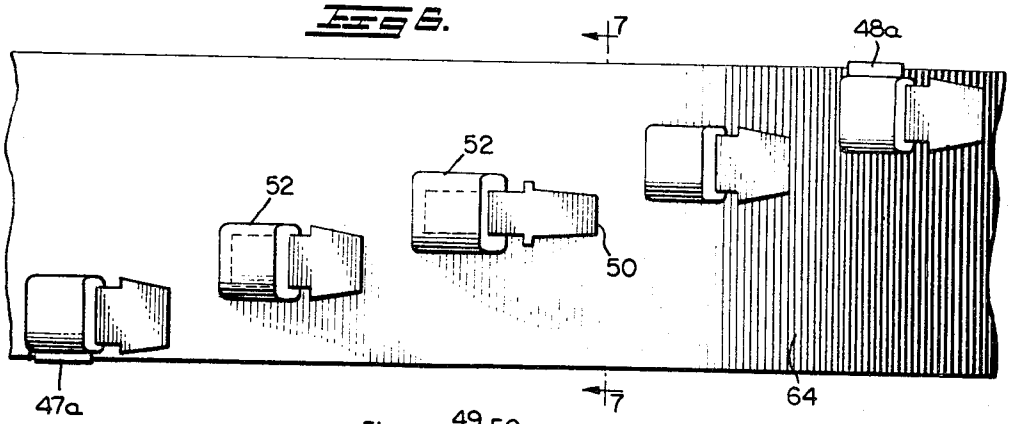
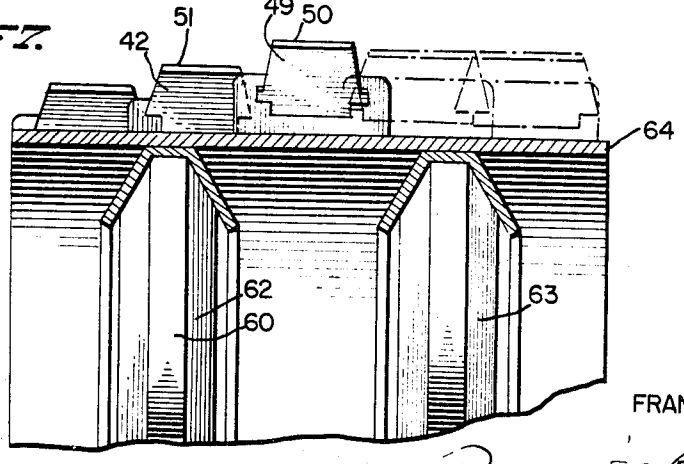


Fig 7.



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United States Patent Office 3,412,490
Patented Nov. 26, 1968

3,412,490

TRENCHING MACHINE

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Filed Sept. 30, 1965, Ser. No. 491,795
6 Claims. (Cl. 37—87)

ABSTRACT OF THE DISCLOSURE

A high-speed trenching machine having a digger wheel provided about its periphery with a plurality of arrays of digging teeth, each array of teeth including teeth of different form arranged in a predetermined manner to perform different cutting functions, the digger wheel being associated with earth deflectors and the mechanism mounted for a resilient application of power.

This invention relates to improvements in high speed trenching machines.

The main object of the invention is to provide a trenching wheel for high speed forming of trenches for the laying of cables, pipes and the like and consists in the novel arrangement of driving means for rotating a large trenching wheel at a constant high speed of rotation, whereby the novel cutters carried by the trenching wheel, because of the velocity of rotation of the wheel, will discharge the earth outwardly at the sides of the trench without the use of special earth handling mechanism, as is conventional in machines of this type.

One of the objects of the invention is to provide at the inner face of the trenching wheel a continuous channelway for receiving and frictionally engaging the peripheral area of resilient drive wheels rotated and controlled from a suitable source of power.

Another object of the invention is to utilize a plurality of pneumatic or resilient drive wheels for frictionally engaging a channelway carried at the inner face of the excavating or trenching wheel, whereby the excavating or trenching wheel is frictionally engaged and driven from two spaced points, the points of engagement between the pneumatic drive wheels and the digger or trenching wheel being laterally spaced at the upper portion of the digger or trenching wheel at a point above the axis of said trenching wheel.

Another object of the invention is to mount a pair of drive wheels for a digger wheel, the drive wheels having a soft elastic frictional engaging area which is urged by adjustable supporting means into appropriate frictional contact with the digger wheel to insure positive and continuous rotation of the latter.

More specifically, the invention comprehends a supporting frame for a digger or trenching wheel, the supporting frame being associated with positively driven spaced penumatic driving wheels located at opposite inner sides of the trenching wheel and above its transverse axis, and positioned by adjusting means including spaced idlers engaging the digger wheel below its transverse axis at spaced points generally beneath the spaced drive wheels, the drive wheels being positively driven from a hydraulic pump gear assembly mounted on the frame and connected by appropriate chain or belt means.

Another feature of the present invention is the arrangement and mounting of a plurality of cutter blades at the outer periphery of the digger wheel, the blades being located in continuous array, each array including a cutter blade at the peripheral center of the digger wheel and at least one cutter blade fore and aft of each of the center blades and laterally spaced at each side thereof so that the cutting area is transversely limited to reduce to a minimum the power required to provide high speed continuous operation.

Another feature of the invention is the provision of clearer blades between the various arrays of cutters to facilitate the removal and discharge of the earth.

Another feature of the invention is the provision of a novel form of drive channel for association with pneumatic drive wheels, the drive channel forming a backing and reinforcement for the excavator or digger structure.

These and other objects of the invention will more clearly hereinafter appear by reference to the accompanying drawings forming a part of the instant specification and wherein like characters of reference designate corresponding parts throughout the several views, in which:

FIG. 1 is a side elevation of the assembly;

FIG. 2 is a sectional view on line 2—2 of FIG. 1;

FIG. 3 is a vertical section on line 3—3 of FIG. 1;

FIG. 4 is an enlarged fragmentary top plan view of the trenching wheel shown in FIG. 1;

FIG. 5 is an enlarged fragmentary view in elevation of the trenching wheel shown in FIG. 1;

FIG. 6 is a fragmentary view of a modified array of cutter teeth; and

FIG. 7 is an illustration of a plural drive for the trenching wheel shown in FIG. 6.

The trenching or digger wheel is indicated by reference character **1** and has mounted about its outer periphery a plurality of digger teeth **2** and within the digger wheel and forming a back therefor is mounted an inwardly facing annular channel including a base portion **3** and laterally extending annular wings **4** and **5**, the channel being centrally positioned with respect to the digger wheel and extending entirely about its inner peripheral surface and secured thereto in any suitable manner as by welding, rivets or the like. The channel or channelway is illustrated generally as of U-form in cross-section, however, it will be understood that the wings **4** and **5** of the channelway may be contoured to insure snug engagement with the pneumatic or resilient drive wheels **6** and **7**, and the latter may be of conventional rounded contour, the purpose obviously being to insure maximum frictional engagement between the driving and driven surfaces.

The digger wheel **1** is supported by a frame consisting of beams **8** and **9** spaced at each side of the wheel and having their terminals supported by a suitable tractor or the like, not illustrated in the present disclosure. The beams **8** and **9** are illustrated as located above the digger wheel's transverse axis, as shown in FIG. 1. The spaced pneumatic drive wheels **6** and **7** are fixed to driven shafts **10** and **11** mounted at their terminals in bearings **12** and **14** at opposite sides of the digger wheel **1** and on the frame members or beams **8** and **9**. The pneumatic drive wheels **6** and **7** are driven by the chains or belts **15** and **16** which mesh with the sprockets **17** and **18** mounted on the shafts **10** and **11** which carry the pneumatic drive wheels **6** and **7**. To drive the chains **15** and **16** there is provided the spaced sprockets **19** keyed to the driven shaft **21** operated from a hydraulic pump gear assembly **22** supported on the base **23** carried by the frame member **8**. The base **23** obviously may extend between the spaced frame members **8** and **9** and may be supported from both of these frame members. For driving the hydraulic pump gear assembly, suitable pipe lines **24** and **25** are provided and are connected with a suitable source of fluid under pressure mounted on an adjacent tractor mechanism.

It will be understood that in lieu of the two supporting beams **8** and **9**, in instances where the trenching wheel **1** is relatively small, a single beam may be provided for

supporting the pneumatic or cushioned drive wheels **6** and **7**. In the present illustration both beams **8** and **9** are shown supporting the drive wheels **6** and **7** with the hydraulic pump gear assembly mounted on a single beam. Where two beams are used the adjusting and jacking mechanism, including the downwardly extending angle braces **30** and **31**, may be supported from cross planks between the two beams as shown at **32** in FIG. 2, or separate jacks or pressure foot assemblies can be mounted beneath each individual beam, it only being necessary that the pressure assembly include the fixed angle braces **30** and pivoted angle brace **31**, adjustable cross arm **33** with the adjustable coupler **34** and lock arm **35**.

The coupler **34** includes a head **34***a* threaded on the cross arm **33** and extending into the swiveled head **36** formed with an annular array of openings **37**. The threaded coupler head **34***a* has openings adapted to register with the openings **37** in the swiveled head **36** whereby these parts, after adjustment, can be locked together by a lock pin carried on the end of lock arm **35** mounted on the cross arm **33**. The swiveled head **36** is mounted on the arm section **38** pivotally mounted on the stub shaft **39** fixed to the wheel mounting **40** carrying an idler wheel **41**, whereby the brace **31** can be moved laterally with respect to the angle braces **30** which support at their lower ends the idler wheel **42** carried in the wheel mount **43**. The cross arm **33** is pivoted at **44** to facilitate its alignment and association with the arm section **38** and these arm sections are extended and locked to apply pressure to the idler wheels **41** and **42** which travel in the channelway **3** through swinging movement of the pivoted brace **31** on its pivot **45**. Pressure applied by the wheels **41** and **42** likewise urge the drive wheels **6** and **7** into the channelway to provide the necessary seating and friction for driving the digger wheel **1**.

In FIGS. 4 and 5 I have illustrated fragmentary views of a digger wheel showing the arrangement of the arrays of digging teeth which are illustrated as three in number with the teeth **47** and **48** at the outside edges of the digger wheel and an intermediate tooth **49** having its cutting edge **50** projecting slightly beyond the outer cutting edges **58** of the outer teeth **47** and **48**. Laterally projecting clearance cutters **47***a* and **48***a*, as shown in FIGS. 5 and 6, extend laterally from the outer faces of the outer teeth **47** and **48** to sweep the edge of the trench being dug. These clearance cutters **47***a* and **48***a* are shown as hard steel inserts which are inserted in slots in the sides of the outer tooth holders **52**. The clearance cutters **47***a* and **48***a* may be adjusted to extend laterally of the cut a sufficient distance to clear the walls of the trench to permit the free movement of the trenching wheel and to maintain a smooth surface without inwardly projecting wall portions. As shown in the present disclosure, the clearance cutters are inserted in slots in the sides of the tooth holders being wedged into appropriate slots in the manner of the teeth **47**, **48** and **49**.

It will be understood that where the digger wheel is relatively large, as shown in FIGS. 6 and 7, it may include two or more drive channels **60** and **61** in which the pneumatic or rubber-cushioned drive wheels are located for frictional engagement and driving cooperation with the digger wheel, the sections of the drive wheels being shown at **62** and **63**. Where transversely spaced multiple drive wheels are provided and engage with multiple channels, these drive wheels will be mounted on a common shaft so that the wheels will be rotated at the same speed. It will be noted that whether there are a plurality of laterally spaced drive wheels or a single drive wheel at each driving point, it is important that the points of cutting contact be symmetrically positioned at each side and at the center of the trenching wheel so that the driving forces will be uniformly distributed.

Referring again to the teeth **47**, **48** and **49** of FIGS. 4 and 5, it will be noted that each tooth is provided with a tapered shank, shown in dotted lines at **50**, and these tapered shanks extend into pockets **51** formed in tooth holders **52** mounted on the flat radially extending reinforcing annular rim **53** medially projecting from the outer center face of the wheel rim **54**. The tooth holders **52** have depending flanges **55**, the middle tooth of each array having a pair of depending flanges for straddling the rim **53** and the outer teeth of each array of three teeth having a single depending flange **55** to be secured to the sides of the rim **53**, whereby the teeth are properly positioned. The flanges **55** may be welded, riveted or bolted to the rim **53**, as desired. Located at suitable points about the rim **54** are earth clearers **56** which are formed with angular flanges **57** welded to the annular rim **53** and welded at their base **57***a* to the rim **53**. The clearers **56**, as shown in FIG. 4, are angularly positioned to deflect any earth accumulating between the teeth outwardly to each side of the trench.

In FIG. 3 the inwardly facing channel is shown mounted at its base **3** on the inwardly extending annular flange **3***a* located medially of the inner face of the rim **54**. However, this inwardly facing channel may be mounted directly on the inside face of the rim, as shown in FIG. 2, or in the case of multiple channels, as shown in FIG. 7.

Where more than three teeth are used in a single array, as in FIGS. 6 and 7, the same disposition of the relative arrangement of cutting edges may be provided. In FIGS. 6 and 7 it will be seen that the tooth sockets are fixed directly to the outer face of the rim **64**. Likewise, the multiple drive channels **60** and **61** have their bases directly fixed, as by welding, to the inner face of the rim **64**.

In the prior art it has been the practice to form relatively wide trenches for the laying of cables and the like of relatively small diameter, the trenching machinery moving slowly and delivering the removed earth from the trench to a separate endless conveyor feeding through the trenching wheel. The width of the trench cut made the operation slow and expensive in time, labor and the utilization of power. It has been found that by using a friction drive and particularly a friction drive inherently providing a certain amount of cushioning action for the digger wheel provided with appropriate teeth arranged in an appropriate manner, the digger or trenching wheel can be rotated at high speed which results in projection of the removed earth at each side of the trench, a rapid trenching operation and a minimum of effort and expense. Using a relatively narrow trenching wheel of novel design driven at high speeds requires less power and lighter machinery, the lighter machinery placing less load on the sides of the trench and preventing any tendency of caving before the laying of cable or the like which occurs immediately after the formation of the trench.

To insure the formation of a clean trench, means are provided to prevent the possible dropping of loose earth in the trench and this means includes the provision of side housing panels **70** and **71** mounted at the base of the supporting beams **8** and **9** and being parallel at the sides of the trench cut, and the earth deflector sheets **72** and **73** mounted at the top of the supporting beams **8** and **9** and converging inwardly within the upper portion of the drive wheel. Thus at no time is any loose earth available to fall into a newly formed trench prior to the laying of a cable, pipe or the like. It will be understood that the high velocity of rotation of the digger or trenching wheel may, under certain conditions of the soil, result in a shower of projecting soil and the trenching wheel, traveling at high speed due to its cutting capacity, may move beneath the falling soil. By the present structure and arrangement all earth is laterally disposed of until the trench is refilled following the laying operation of the cable or pipe.

It will be noted in FIG. 1 that guide wheels **70***a* are mounted on angle brackets **71***a* carried by the cross members **8** and **9** at spaced points at each side of the digger wheel to maintain the digger wheel in alignment, particularly in instances where the digger wheel is relatively

large in diameter and is being driven at high speeds during an excavating operation. The guide wheels **70***a* will also facilitate the alignment of the digger wheel when the latter engages unusual obstructions which might tend to cause a shifting of the digger wheel on its axis.

What is claimed is:

1. In a trenching machine, a rotatable digger wheel assembly including an outer annular rim structure having mounted about its outer periphery a plurality of spaced teeth arranged in arrays comprising a center tooth and marginal teeth positioned fore and aft of each center tooth and at each side thereof and all of the teeth projecting at an obtuse angle with respect to the rim in the direction of rotation of the digger wheel, clearer blades interposed between certain of the teeth and projecting from said rim at a greater angle with respect to said rim than said teeth, an annular channelway fixed to the inner face of said rim for engagement with a driving means, said driving means including spaced cushioned drive wheels, and power means for driving said drive wheels.

2. The structure of claim **1** characterized in that said center tooth is of greater length than said marginal teeth to form a deeper cut than the marginal teeth.

3. The structure of claim **1** characterized in that said power means is a hydraulic motor whereby a continuing resilient application of power is provided to the digger wheel.

4. The structure of claim **1** characterized in that a frame is provided for supporting the drive mechanism and the digger wheel and side shields are mounted on the frame at each side of the digger wheel to deflect earth from said wheel to each side thereof.

5. The structure of claim **1** characterized in that medial plate means extend outwardly of the rim of the digger wheel in a plane normal to the plane of the rim and said spaced teeth are mounted thereon.

6. The structure of claim **1** characterized in that guide wheels are mounted on a frame and engage lateral faces of the digger wheel at spaced points in its circumference to stabilize the same during operation.

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