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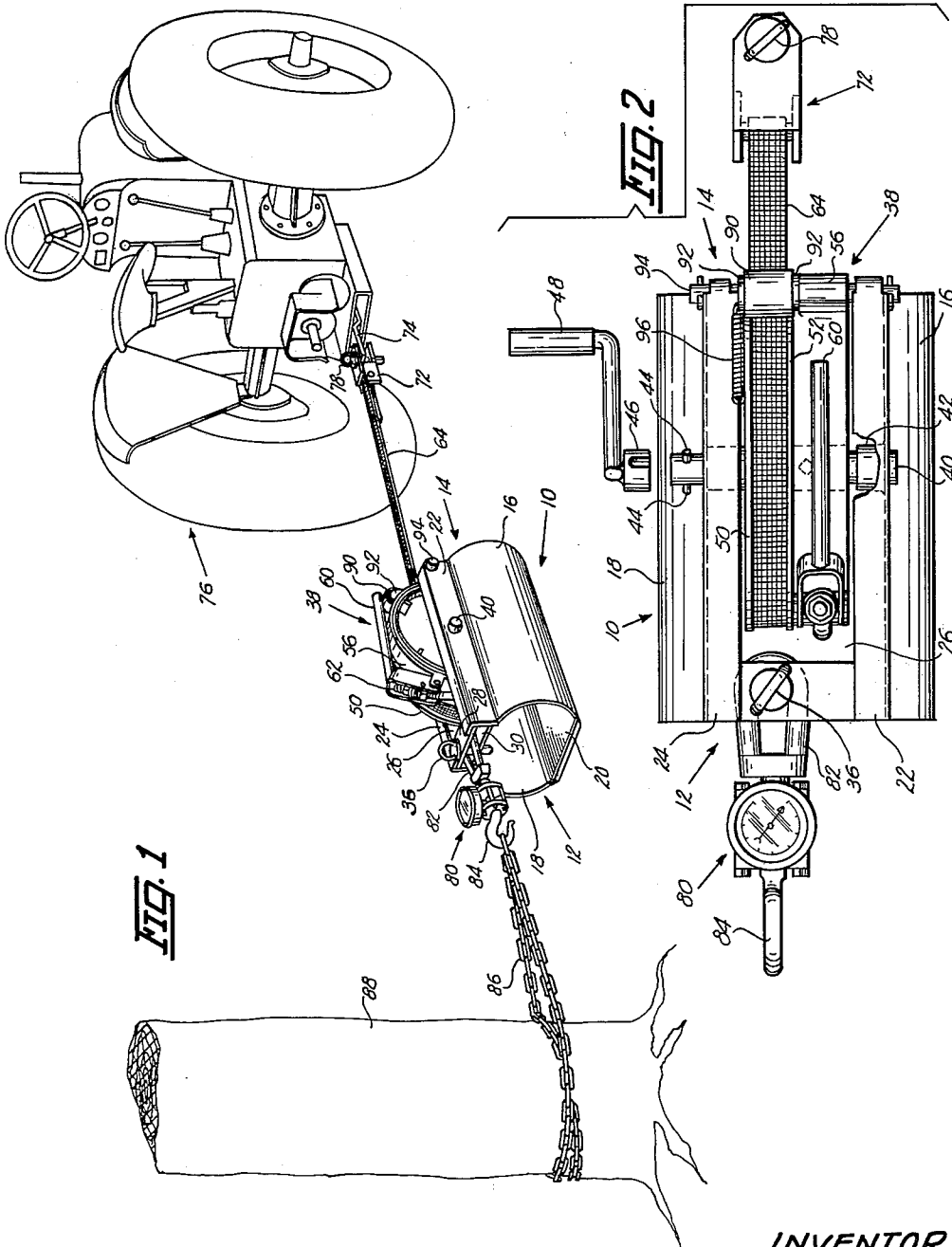
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TESTING DEVICE FOR TRACTOR PULLING POWER

Filed July 26, 1960

2 Sheets-Sheet 1



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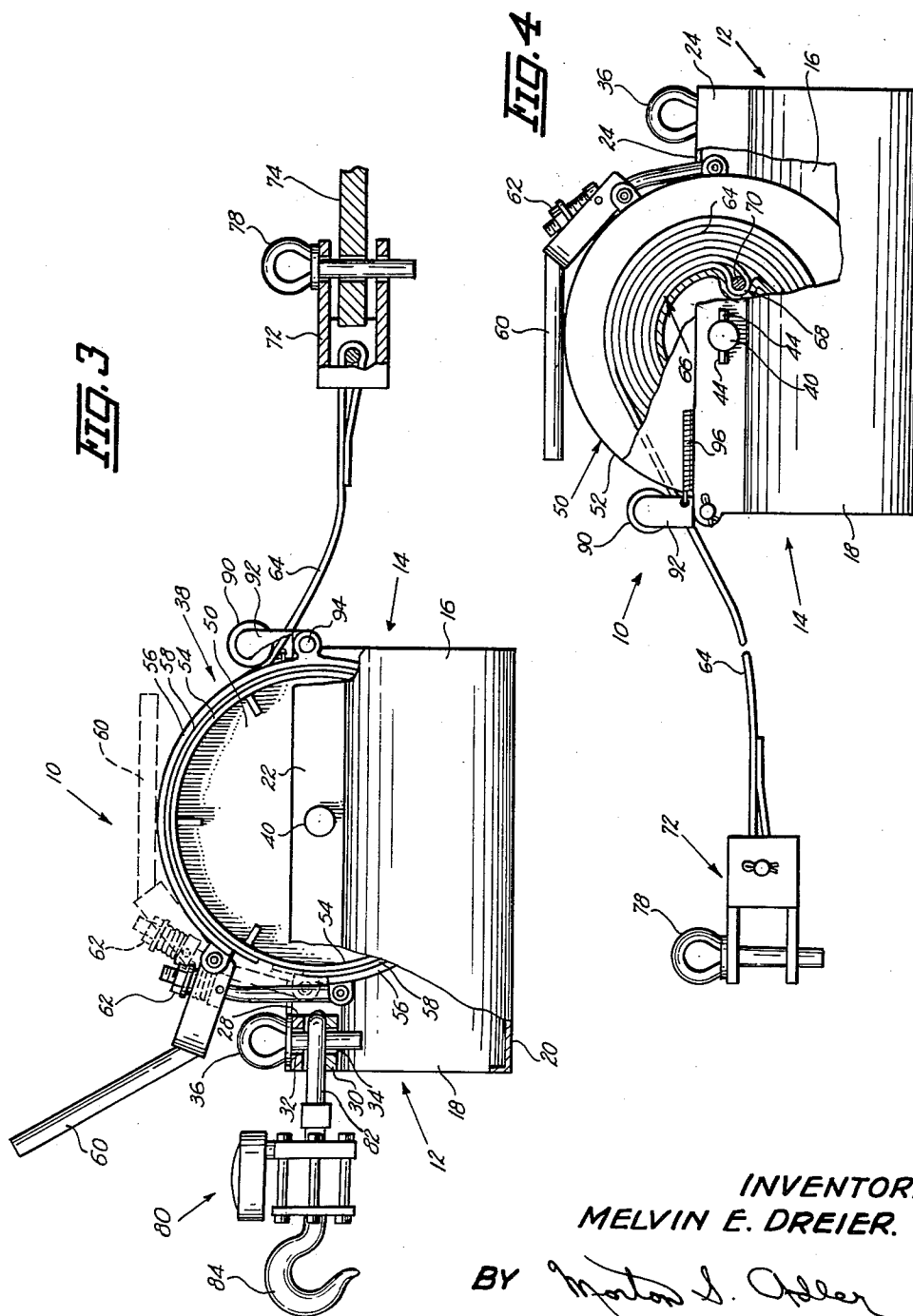
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3,110,176 TESTING DEVICE FOR TRACTOR PULLING POWER

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This invention relates to apparatus for testing the drawbar pulling power of tractors and one of the important objects contemplated herein is the provision of a highly efficient and portable braking unit capable of creating a load resistance in excess of that which the tractor is capable of pulling.

Another feature of this device resides in the provision of a suitable gauge means connected to my braking unit to measure the pull exerted thereon.

A further object herein is the provision of means to adjust the amount of resistance offered by this invention against a pulling force.

Still another object is to provide apparatus of the above class which will accurately determine the amount of tractor power lost between the motor and that actually delivered to the ground because of friction of gears, binding in the shafting and bearings and any other places where power may be dissipated.

Further objects and the more obvious advantages of the invention will be mentioned or else appear plainly from the description which follows.

This invention consists of novel parts and combination of parts to be hereinafter described whereby the objects set forth are attained, as pointed out in the claims, and illustrated in the accompanying drawings, in which:

FIG. 1 is a perspective view of this invention shown connected at one end to the drawbar of a tractor and secured at the other end to an anchor means while in use.

FIG. 2 is an enlarged top plan view of this testing apparatus,

FIG. 3 is an enlarged side view of this device with portions broken away to more fully illustrate its construction and also showing the end portion of the tractor drawbar in section with the rope used with this device attached thereto, and

FIG. 4 is an enlarged side view opposite to that shown in FIG. 3 showing only the brake drum assembly of this device which is partially broken away to illustrate the rope windings associated therewith.

Referring to the drawings an elongated rigid housing or base is designated generally by the numeral 10 and has for purpose of this description a rearward end 12 and a forward or front end 14. Base 10 includes the upstanding concavo-convex sides 16 and 18 integral at their bottom to the flat bottom member 20 and each terminating along their longitudinal top edges in the respective bars or plates 22 and 24 which as shown are preferably made of angle material and are in parallel spaced relationship to define the longitudinal opening 26 communicating with the interior of base 10. Plates 22 and 24 are connected at the rearward end 12 by the vertically spaced parallel bars 28 and 30 which are provided with the respective registering holes 32 and 34 for removably receiving a pin 36.

A drum assembly 38 is disposed within housing 10 so as to partially project upwardly through opening 26 and is rotatably mounted on a shaft 40 secured between plates 22 and 24. Suitable bearings 42 may be provided for shaft 40 in a well known manner. One end of shaft 40 projecting from plate 24 (FIG. 2) is provided with diametrically extending lugs 44 for receiving a keyed collar 46 of a handle 48 so that shaft 40 can be manually rotated as will later appear. The drum assembly 38 includes a drum member 50 having adjacent peripheral grooves

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separated by the peripheral flange 52. The surface or face of one of the grooves is in effect a brake drum 54 (FIG. 3) on which there is mounted the brake band 56 and lining 53. An operating lever 60 is connected to the free ends of the brake drum 54 in a well known manner so that members 54, 56, 58 and 60 are actually an external type contracting brake for which no invention per se is claimed. An adjustment bolt and nut means 62 also connects the free ends of the brake drum 54 so that the effectiveness of band 56 against the drum 54 can be selectively altered. The other groove on drum 50 serves as a spool or reel on which is wound a length of rope or strap material 64, the same being spliced as at 66 to form a loop 68 for attachment to an anchor means 70. A most satisfactory rope member 64, determined from successful field operation of this device, has been found in a twenty thousand pound test nylon web rope or strap having a length of approximately thirty-five feet and with splice 66 being preferably about eighteen inches long.

The free or outer end of the strap 64, which unwinds from the front end 14, is secured to a clevis 72 that is removably attachable to the drawbar 74 of a tractor 76 by means of pin 78 in a well known manner. At the rearward end 12 a hydraulic pullmeter 80 capable of registering preferably a ten thousand pound pull is used and such meters or gauges are commercially available. A ring or loop end 82 of meter 80 is passed between bars 28 and 30 so as to be secured by pin 36 and a hook 84 on the other end is used for engaging a chain or the like 86 suitably anchored to a tree or the like 88 as shown in FIG. 1. A holddown roller 90 for strap 64 is carried by an arm 92 pivotally attached at one end to a shaft 94 that is rotatably mounted at the forward end 14 of member 22 and a spring 96 connects arm 92 to member 22 intermediate the ends thereof so as to hold roller 90 in bearing engagement with strap 64 against the brake band 56. This roller 90 also serves as a strap alignment means when the strap is being wound and keeps the strap 64 from slipping off its reel when it is completely reeled in.

In describing the operation generally, the meter 80 is attached to the rearward end 12 of base 10 by pin 36 as described and hook 84 is secured to a suitable anchor which for practical purposes in field use is easily accomplished by fastening a chain 86 to a tree 88 and engaging hook 84 with the chain as shown in FIG. 1. Strap 64 is initially manually wound upon the drum 50 by applying handle 48 to shaft 40 in a well known manner until only the clevis 72 projects beyond the roller 90. Nut 62 (FIGS. 3 and 4) is then adjusted to set the brake band 56 so that with lever 60 moved to the position shown in FIG. 4 to set the brake, the tractor being tested will be able to pull the strap 64 out for only about thirty of the preferred thirty-five feet of strap used. Clevis 72 is then engaged with the tractor drawbar 74 by pin 78 ready for the test.

The tractor operator using either a marked throttle setting or a full throttle releases the clutch in the same manner as if working the tractor in the field whereby strap 64 will unwind with the forward movement of the tractor. The load resistance by the strap will multiply with each revolution until it reaches a point too great for the tractor to overcome and the tractor engine will stop. By virtue of the pre-set brake adjustment, the motor of the tractor will die when all but about five feet of the strap 64 has been unwound. At this point meter 80 will indicate the actual pounds of pulling power and repeated tests with the same tractor will result in the same or substantially the same meter reading so that all guesswork is eliminated in determining how much pulling power is lost between the engine and what is actually delivered to the ground.

The initial adjustment of nut 62 referred to above may require a certain amount of trial and error experiment until an operator of this device has become accustomed to it, but actual tests with a tractor in plow gear or a gear where the drive wheels will not spin has demonstrated that the proper brake setting for different size tractors can be readily determined.

The length of tractor travel in the above test together with the progressively increasing resistance offered by the braking unit provides an accurate and uniform means for testing the actual tractor pulling power delivered to the ground and it can also be mentioned that this device may be used to test tire traction and differences in weight.

More specifically in the operation of this device as described, it is pointed out that as the strap 64 is unwound from the reel or drum 50, it produces a progressively decreasing torque arm about the axis to the line of pull of the strap as the tractor moves. Consequently because of the fixed diameter of the brake and its fixed setting, the applied force from the tractor required to unwind the strap becomes progressively greater as the torque arm of the drum becomes shorter. Eventually such force will equal the full pulling power available at the tractor drawbar and beyond this point the tractor engine will die with meter 80 indicating the actual pounds of pulling power which the tractor was capable of producing. It is, of course, necessary that the tractor be in a proper gear to avoid spinning or slipping of the wheels or else accuracy of the test is not possible and this can be quickly determined by the operator.

Tractors usually have a rated pulling power and the brake can be pre-set to provide a counter-force to the torque arm on the drum which is equal to, or substantially so, to such rated power. Thus, initially, only part of the tractor power is required to start the unwinding of the strap, but as the torque arm decreases and the counter force of the brake remains constant, greater pulling force is necessary to unwind the strap with the resulting increasing tension on the strap as described.

It will be understood that the phraseology employed herein is for the purpose of description and not for limitation and that modifications and changes in the construction and arrangement of this invention can be made within the scope of what is claimed, without departing from the spirit and purpose thereof. It is thus intended to cover by the claims, any modified forms of structure or mechanical equivalents which may be reasonably included within their scope.

I claim:

1. Apparatus for testing the pulling power of a tractor or the like comprising, a base, a drum assembly rotatably mounted on said base, brake means on said drum assembly, adjustable means on said brake means to hold said brake means in a fixed predetermined pressure engaging relationship with said drum assembly, a flexible strap wound on said drum assembly and adapted at one end for removable attachment to a tractor or the like, the unwinding of said strap from said drum assembly in response to a pulling force by a tractor producing a progressively decreasing torque arm about the axis to the line of pull of said strap and thereby as said strap unwinds requiring a progressively greater pulling force by the tractor to rotate said drum assembly against the counterforce of said brake means, a pullmeter remov-

ably attached to said base, means for securing said pullmeter to an immovable anchor, the amount of counterforce provided by the fixed setting of said brake means being at least equal to the rated pulling power of the tractor being tested, the length of said strap being sufficient so that before it is completely unwound the amount of force required from the tractor to rotate said drum assembly against the resistance of said brake means will have surpassed the rated pulling power of the tractor, and when said tractor's pulling power equals the resistance provided by said brake, the tractor engine will die and the pulling power of the tractor at this point will be indicated by said pullmeter.

2. Apparatus for testing the pulling power of a tractor or the like comprising, a base, a drum assembly rotatably mounted on said base, brake means on said drum assembly, a flexible strap wound on said drum assembly and adapted at one end for removable attachment to a tractor or the like, a pullmeter removably attached to said base, means for securing said pullmeter to an immovable anchor, said strap being unwindable from said drum assembly under the pulling power of a moving tractor attached thereto, the unwinding of said strap producing a progressively decreasing torque arm about the axis to the line of pull of the strap, means to pre-set said brake means to effect a fixed resistance force whereby a progressively increasing amount of tractor pulling power is required to unwind said strap as the torque arm decreases, and when the pulling power of said tractor equals said fixed resistance, the tractor engine will die and the pulling power of the tractor at this point will be indicated by said pullmeter.

3. A device as defined in claim 2 including means for rewinding said strap on said drum assembly after said strap is disengaged from the tractor.

4. Apparatus for testing the pulling power of a tractor or the like, comprising, a base, a variable resistance means on said base, means removably connecting a tractor to said variable resistance means so that the pulling power of the tractor can be applied thereto, a fixed counter resistance means on said base acting against said variable resistance means, said counter-resistance being at least equal to the rated pulling power of the tractor being tested, means on said variable resistance means requiring a progressively greater pulling power of a moving tractor to overcome said fixed counter resistance means, a pullmeter removably attached to said base, and means for securing said pullmeter to an immovable anchor, and when said tractor's pulling power equals said counter-resistance, the tractor engine will die and the pulling power of said tractor at this point will be indicated by said pullmeter.

5. A device as defined in claim 4 including means to selectively pre-set said fixed counter resistance means at pre-determined settings.

6. A device as defined in claim 4 including a spring loaded roller pivotally attached to said base and yieldingly engageable with said strap for holding the same in alignment on said drum assembly.

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