Jan. 5, 1971 P. F. REISS 3,552,070

TORQUE LIMITER

Filed Dec. 16, 1968 2 Sheets-Sheet 1

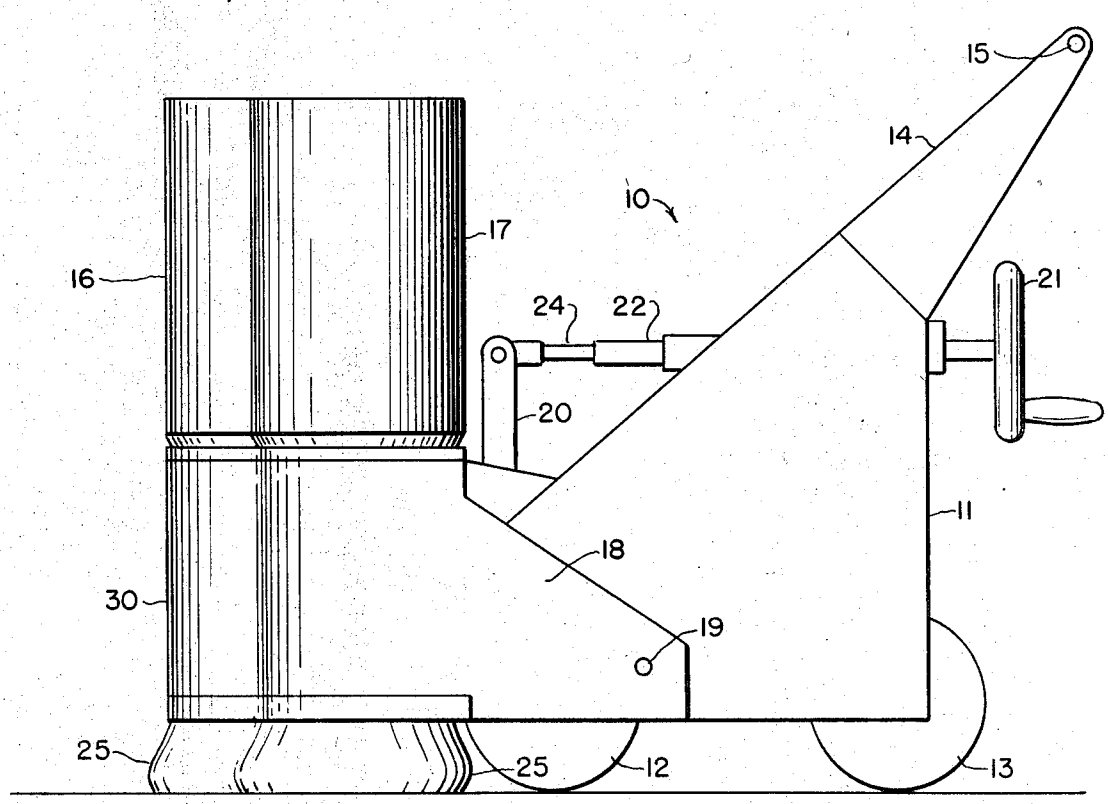


FIG. 1

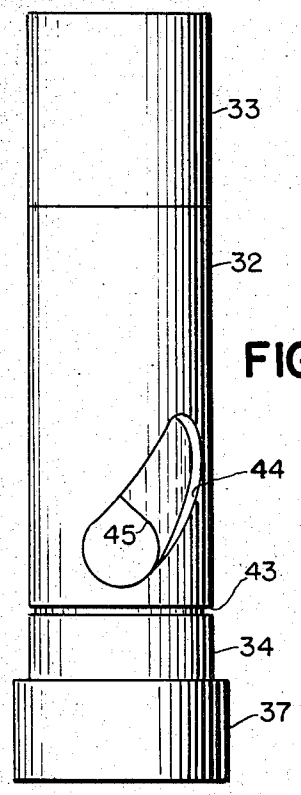


FIG. 2

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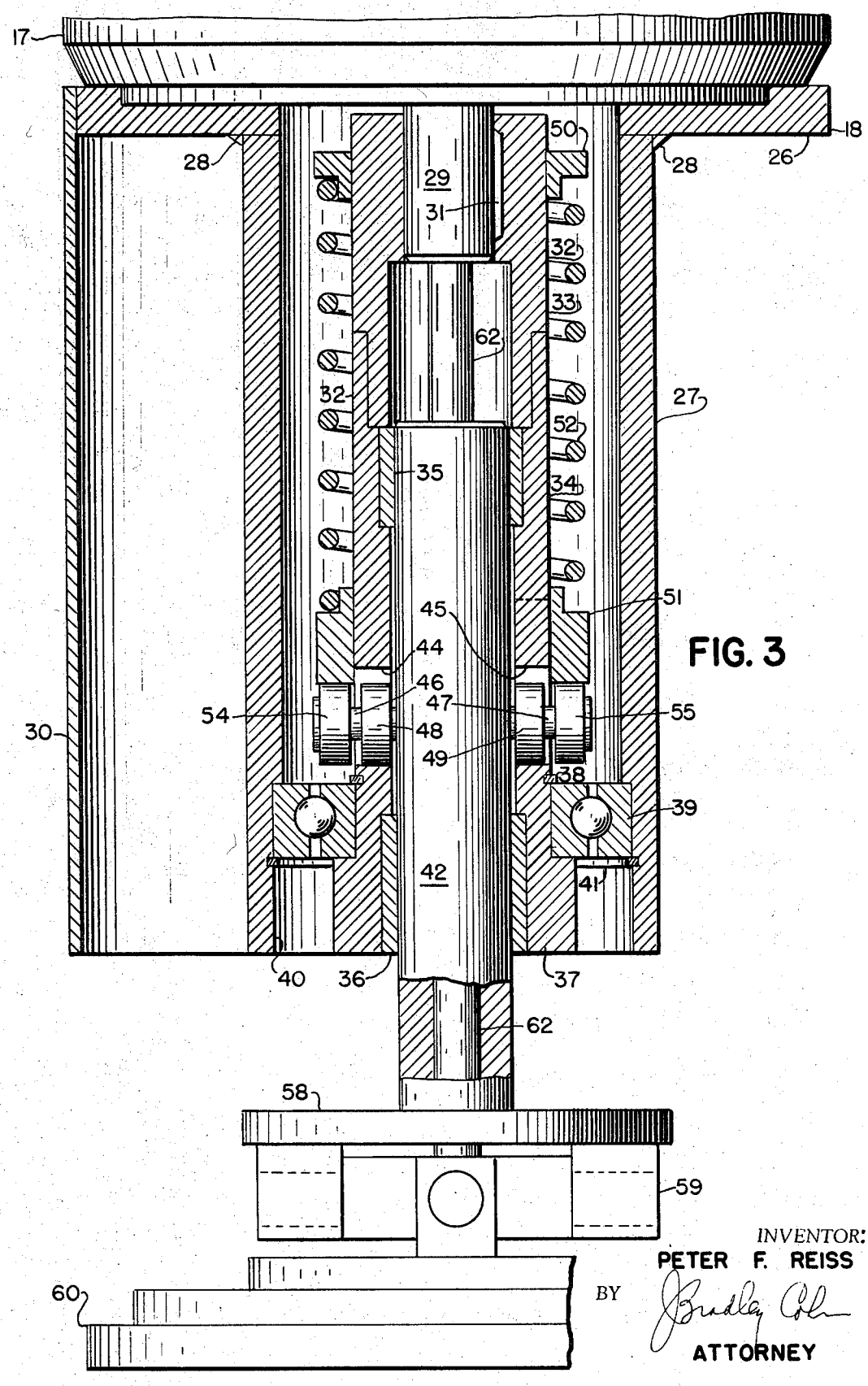


FIG. 3

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United States Patent Office 3,552,070 Patented Jan. 5, 1971

3,552,070

TORQUE LIMITER

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Filed Dec. 16, 1968, Ser. No. 783,938
Int. Cl. B24b 23/00, 25/00
U.S. Cl. 51—177 11 Claims

ABSTRACT OF THE DISCLOSURE

In a floor grinder, a motor drives a hollow vertical shaft. A lower shaft telescopes into the hollow shaft, is spring loaded downward, and has a grinding plate fixed to its lower projecting end. The hollow shaft has at least one spiral drum cam cutout formed in it and the lower shaft has a cam follower extending into the drum cam cutout so that excessive torque imposed by frictional resistance encountered by the grinding plate causes the drum cam cutout to raise the cam follower and the lower shaft and lift the grinding plate thereby limiting torque.

BACKGROUND OF THE INVENTION

This invention relates to floor or terrazzo grinders and the like. Such grinders have one or more vertical motors each of which rotates a grinding plate held against the floor. Soft spots in the floor or other factors causing excessive torque, overload the motors of conventional floor grinders to cause high power demands, blow fuses, burn out the motors, and do other damage.

SUMMARY OF THE INVENTION

A floor grinder has at least one motor driving a hollow, vertical shaft. A lower shaft telescopes into the hollow shaft and has a floor grinding plate fixed to its lower projecting end by means of a universal joint. The hollow shaft has at least one spiral drum cam cutout formed in it. A cam follower extends radially from the lower shaft to engage the drum cam. A spring loaded ring bears on an extension of the follower to urge the inner shaft downward and thereby the grinding plate against the floor. Excessive torque imposed by frictional resistance encountered by the grinding plate causes the drum cam to urge the cam follower, the lower shaft, and the grinding plate upward to thus limit the torque.

The construction of the torque limiter of this invention allows a floor grinder with a five horsepower motor to operate at maximum efficiency with a current fluctuation of less than two amperes. This prevents motor overheating and failure, blown fuses, inefficient operation, and many other problems which beset conventional floor grinders.

The torque limiter of this invention is comparatively inexpensive to fabricate, is automatic and foolproof in its operation, and performs in a superior manner.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side view of a floor grinder according to this invention;

FIG. 2 is a side view of a hollow shaft with two barrel cam cutouts formed therein; and

FIG. 3 is a longitudinal section through a fragment of a motor and a torque limiting drive according to this invention, the drive having a universal joint fixed to its lower end, the universal joint supporting a grinding plate which is shown partly broken away.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As shown in FIG. 1, a floor grinder **10** has a body **11** which rolls on the front and rear wheels **12** and **13**. The rear wheel or wheels **13** may be castered to enable the body **11** to be steered. An extension **14** of body **11** supports the handle **15** with which the operator moves the floor grinder **10**.

A pair of motors **16** and **17** are mounted on a frame **18** which is pivotally fixed to body **11** at **19**. A yoke **20** is fixed to frame **18**. Hand wheel **21** turns a threaded shaft (not shown) to draw link **22** rearward or allow it to move forward to raise or lower motors **16** and **17** as frame **18** pivots about **19**. Link **22** may include a threaded length adjusting portion **24** so that the length of link **22** may be set to place frame **18** in a desired position when wheel **21** is turned as far as it will go in one direction.

It is to be noted that the two motors **16** and **17** are staggered, one slightly in front of the other, so that their grinding plates grind overlapping areas as the floor grinder **10** is moved forward or backward. Flexible skirts **25** extend below frame **18** to surround the grinding plates.

Referring now to FIGS. 2 and 3, motor **17** is mounted on a portion **26** of frame **18**. A tubular support **27** is welded at **28**, or otherwise secured, to extend downward from portion **26** about the shaft **29** of motor **17**. A cover **30**, to the bottom of which skirts **25** are attached as shown in FIG. 1, surrounds tubular support **27**.

By means of key **31**, a hollow shaft **32** is fixed to motor shaft **29**. Hollow shaft **32** is formed in two parts **33** and **34** which are welded or otherwise joined to allow for the insertion of upper bearing **35**. A lower bearing **36** is pressed into the lower end of hollow shaft **32**.

A lower annular flange **37** and a retaining ring **38** secure a ball bearing **39** or the like about the lower end of hollow shaft **32**. The outer race of bearing **39** fits within a larger diameter portion **40** at the bottom of tubular support **27**. A retaining ring **41** may secure bearing **39** therein. The groove **43** within which retaining ring **38** fits may be seen in FIG. 2. A lower shaft **42** is slidably disposed to telescope within hollow shaft **32** while being slidably supported by the bearings **35** and **36**.

As may be most clearly seen in FIG. 2, two spiral drum cam cutouts **44** and **45** are formed in hollow shaft **32** to extend upward at an angle of 60 degrees with the horizontal. Referring again to FIG. 3, two cam follower shafts **46** and **47** are screwed or otherwise fixed into lower shaft **42** to project through the drum cam cutouts **44** and **45**. Inner cam rollers **48** and **49** on shafts **46** and **47** ride on the drum cam cutouts **44** and **45**.

An upper spring retaining ring **50** is welded or otherwise fixed about hollow shaft **32**. A lower spring retaining ring **51** is slidably disposed about hollow shaft **32**. Compression spring **52** extending between rings **50** and **51** urges ring **51** downward. Outer cam follower rollers **54** and **55** mounted on shafts **46** and **47** receive the downward thrust of spring **52** on ring **51** to urge the telescoping lower shaft **42** downward.

A disk **58** is fixed at the bottom of lower shaft **42** to have a universal joint **59** mounted thereunder. Supported by universal joint **59** is a grinding disk **60**. Suitable grease seals (not shown) may be disposed between the lower ends of hollow shaft **32** and tubular support **27** below bearing **35**. If desired, a water conducting tube **62** may extend through a hollow motor shaft **29** and the torque limiting device of this invention to the grinding plate **60**.

In operation, motors **16** and **17** are lowered by hand wheel **21** to enable springs **52** to force a pair of grinding plates **60** against a floor with a force to enable the motors **16** and **17** to drive the grinding plates **60** with a desired operational torque. If some operational factors, such as a soft spot in the floor or an unevenness, increase the torque, hollow shaft **32** will tend to rotate relative to lower shaft **42** so that the rollers **48** and **49** ride upward in the drum cam cutouts **44** and **45**. This raises grinding plate **60**

to relieve the torque on its motor. Thus it may be seen that the torque limiter of this invention is self-regulating.

If the spring **52** is a spring which exerts a greater force as it is compressed, frame **18** may be lowered to produce any desired operational torque within the limitation of the compression of spring **52** by the telescoping of the lower shaft **42**.

While this invention has been shown and described in the best form known, it will nevertheless be understood that this is purely exemplary and that modifications may be made without departing from the spirit and scope of the invention.

I claim:

1. A torque limiter for use in a floor working machine having a motor and a floor engaging grinding plate driven by said motor, said torque limiter comprising, in combination, a drive shaft formed of two telescoping sections, interengaging means secured to said sections to telescope said sections during relative rotation therebetween, said drive shaft being connected at one free end to said motor and at the other free end to said grinding plate, and resilient means urging said grinding plate from said motor, said engaging means on said shaft sections drawing said plate toward said motor against the urge of said resilient means as the result of relative rotation produced by torque resistance to the rotation of said grinding plate by said motor and said drive shaft whereby said resistance is limited.

2. A device as set forth in claim **1** wherein said resilient means is adjusted to said torque resistance may be limited a predetermined amount.

3. A torque limiter for use in a floor working machine having a motor and a grinding plate or the like driven by said motor, said torque limiter comprising, in combination, a first shaft, a hollow shaft within which said first shaft rotatably telescopes, one said shafts containing least one drum cam cutout formed at an angle with the horizontal; a cam follower fixed to the other of said shafts extending into and engaging said at least one drum cam cutout, one of said shafts driving the other by means of said cam follower and said drum cam cutout, and resilient means urging said first shaft outward from said hollow shaft, said shafts being vertically disposed, one of said shafts being driven by said motor and the other of said shafts having said grinding plate fixed to its free end so that excessive torque causes said cam follower to move in said drum cam cutout telescoping said shafts against said resilient means to raise said grinding plate to thereby reduce the excessive torque.

4. The combination according to claim **3** wherein said hollow shaft contains said at least one drum cam cutout and said cam follower extending into and engaging said at least one drum cam cutout projects outward from said first shaft.

5. The combination according to claim **4** wherein said hollow shaft is driven by said motor, said first shaft is a lower shaft and has said grinding plate fixed thereto, and excessive torque causes said at least one cam follower to ride upward in said drum cam cutout raising said lower shaft and said grinding plate.

6. The combination according to claim **5** wherein said hollow shaft contains two oppositely disposed drum cam cutouts and where in said lower shaft has two cam followers engaging said drum cam cutouts.

7. The combination according to claim **6** wherein said spring means urging said lower shaft outward from said hollow shaft comprises spring mounting means fixed to said hollow shaft above said drum cam cutouts, a spring retaining ring slidably disposed about said hollow shaft below said spring mounting means, said cam followers having cam follower shafts extending through said drum cam cutouts outward from said hollow shaft, and a compression spring disposed about said hollow shaft and between said spring retaining means and said spring retaining ring, said compression spring urging said retaining ring downward to bear on said cam follower shafts to urge said lower shaft downward.

8. The combination according to claim **7** wherein said cam follower shafts have inner and outer rollers mounted thereon to engage said drum cam cutouts and said spring retaining ring.

9. The combination according to claim **8** wherein said lower shaft has a universal joint to fix said grinding plate thereto.

10. The combination according to claim **9** wherein said compression spring exerts greater force as it is compressed and with the addition of means to adjust the height of said motor to regulate the operational limits of the torque required of said motor to drive said grinding plate.

11. The combination according to claim **10** wherein said drum cam cutouts are formed at 60 degrees with the horizontal.

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JAMES L. JONES, JR., Primary Examiner

U.S. Cl. X.R.

173—12; 299—41