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POWER TRANSMITTING MECHANISM FOR ATTACHMENTS
FOR SURGICAL TURBINES
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Fig. 1.

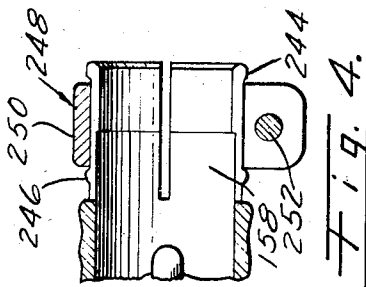
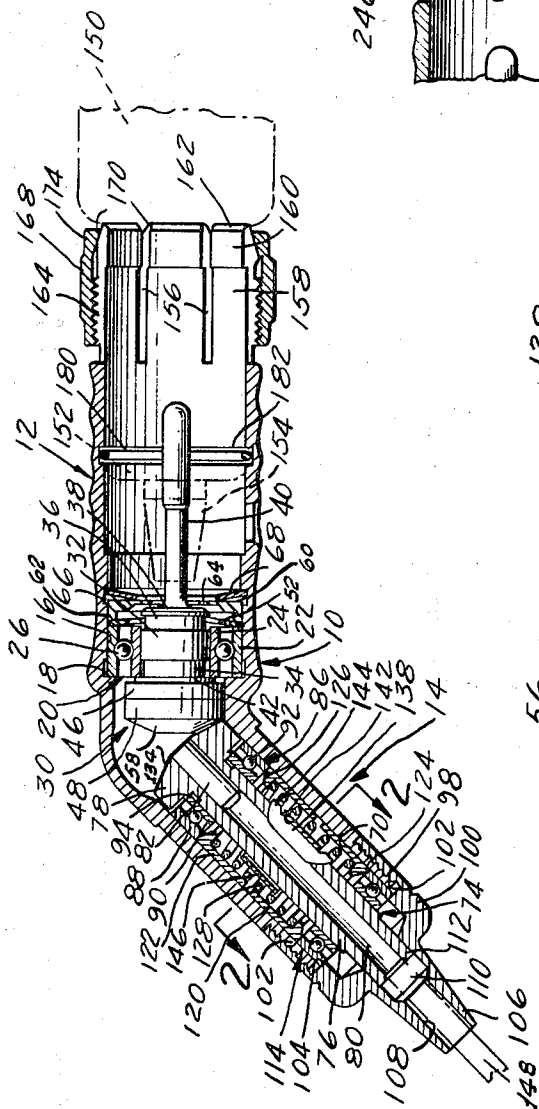


Fig. 4.

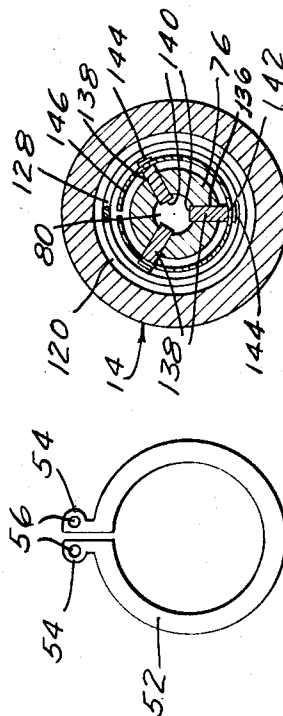


Fig. 2.

Fig. 3.

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1

2

3,443,448

POWER TRANSMITTING MECHANISM FOR ATTACHMENTS FOR SURGICAL TURBINES

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7 Claims

ABSTRACT OF THE DISCLOSURE

Attachment for surgical turbines having a housing with a forward part disposed at an angle to the axis of the turbine so that the working part of the tool is more readily manipulated at the point of use. A chuck arrangement is disposed in the angular part for releasably holding drills, burrs and the like. A power-transmitting mechanism includes driving and driven heads with beveled friction edges, the driven head being attached to a spindle mounted for rotation and longitudinal movement and resiliently urged in a direction to effect frictional engagement of the beveled edges of said heads.

This invention relates broadly to power transmitting means but is especially suited as an attachment for surgical turbines and the like.

While the invention has special utility in connection with surgical turbines, and is shown and described in such connection, it is to be understood that its utility is not confined thereto.

Surgical turbines or motors used for drilling and the like are of small size and light weight and are adapted to be held pen-like in the hand. These turbines have various uses such as dental drilling, bone drilling and sawing operations and the like. These turbines operate at very high speeds such as 85,000 to 100,000 r.p.m.

Generally the burr or other cutting tool extends axially of the turbine and in many situations is awkward to use. It is therefore an object of the invention to provide an attachment for such turbines, motors or other power source wherein the burr or other cutting tool is disposed at an angle to the axis of the turbine so that working part of the tool is more readily manipulated at the point of use. Another object of the invention is to provide accessory or device of this character having the working part of a burr or other tool readily visible. Still another object of the invention is to provide a device of this character that can be used in locations where the conventional type of device cannot be used at all or with great difficulty. For example, the present device can be readily used for work under a microscope. Also, surgical turbines are pneumatically operated and the exhaust of many is at the forward end so that it may cause difficulty in the performance of the work. The present device eliminates this difficulty by positioning the working or cutting part of the tool out of line of the exhaust of the turbine. A further object of the invention is to provide a device of this character having novel collect means.

The embodiment herein disclosed comprises an improved attachment for existing turbines or the like and includes a housing having a first or rear housing part for releasable attachment to the turbine or drill in longitudinal or axial alignment therewith. There is a second or forward housing part that is inclined downwardly and forwardly so as to make an obtuse angle relative to the rear housing part. The power transmitting mechanism is disposed in the housing and has a driving member provided with a stem or shaft that is connected to the tur-

bine drill. The driving member has a forward face that is frusto-conical. There is also a driven member having a frusto-conical end matching the inclination of the inclined part of the driving member and spring urged into operable engagement therewith to provide and maintain the correct pressure for the driving connection. One of these members has a face of friction material such as used for brake linings for example.

There is also a novel collet arrangement embodied in the mechanism for releasably securing the shank of a burr or the like.

The characteristics and advantages of the invention are further sufficiently referred to in connection with the following detailed description of the accompanying drawings which represent one embodiment. After considering this example skilled persons will understand that many variations may be made without departing from the principles disclosed and I contemplate the employment of any structures, arrangements or modes of operation that are properly within the scope of the appended claims.

Referring to the drawings, which are for illustrative purposes only:

FIG. 1 is a longitudinal sectional view of an attachment embodying the invention;

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

FIG. 3 is an enlarged view of a retainer ring; and

FIG. 4 is an alternative clamping arrangement for attachment of the invention to a pneumatic motor.

Referring more particularly to the drawings, there is shown a housing, indicated generally at 10, of suitable material. Various metals or other material may be used for the housing but since the device is used in surgical work stainless steel is used.

The housing has what will be termed the rear portion or part, indicated generally at 12 and a downwardly and forwardly extending part, indicated generally at 14, and termed an angle or angular part. These housing parts are shown as being integral.

The rear housing part 12 is hollow with a bearing receiving bore 16 at the forward end, there being an annular shoulder 18 at the forward end of the bore 16. A roller bearing, indicated generally at 20, has an outer race 22 and an inner race 24 with the usual balls 26 operably disposed therebetween.

There is a drive shaft assembly, indicated generally at 30, having a body 32 the central portion or part of which is operably received within the inner race 24 of the bearing assembly 20. At the front and rear ends of the central part of the body there are grooves 34 and 36 respectively. The rear wall of the groove 36 is defined by an annular flange 38 of substantially the same diameter as the central part of the body and from which an axial stem or shaft 40 extends rearwardly. The front wall of the forward or front groove 34 is defined by an enlarged diameter part 42 which is of larger external diameter than the internal diameter of the inner race 24 of the bearing assembly 20.

At the front end of the body 32 there is head 46 of greater diameter than and integral with the part 42 and at the forward end of said part. Head 46 has a facing or friction member 48 secured or otherwise bonded to the front face thereof by any suitable well known means. The member 48 has a frusto-conical forward or front end including the inwardly and forwardly inclined annular surface 58.

The drive shaft assembly is retained in operative position by means of a slightly dished retaining ring 52 loosely disposed in the rear groove 36 of the head 20, said ring being of well known character and best shown in FIG. 3. Ring 52 is split and has ears 54 extending generally radially at the free ends at opposite sides of the split. There

are also holes 56 in the ears for reception of a tool for installing the ring or removing same. When installed there is an inner part of the ring that is adapted to engage the flange 38, said ring being of greater outside diameter than the inner diameter of the inner bearing race 24 so as to be engageable therewith.

A shield indicated generally at 60, comprises a cylindrical part 62 disposed within the bore 16 with its forward end engaging the rear end of the outer bearing race 22. At the rear end of the cylindrical part 62 there is an inturned flange defining a wall 64 having an axial opening therein through which the stem or shaft 40 extends.

At the rear of the bore 16 there is an enlarged internal groove 66 in which is received a slightly dished retaining ring 68 similar to the ring 52 but with the ears at the free ends thereof turned inwardly. Retaining ring 68 reacts between the rear wall of the groove 66 and the wall 64 of the shield thereby securing the bearing 20 and the drive shaft assembly in operable position.

Angle housing part 14 is also hollow, having a longitudinally extending cylindrical bore 70 therethrough, there being a chamber 72 between the interior of the rear part 12 of the housing and the angle part 14. The head 46 and friction facing 48 for the head extend into chamber 72.

Disposed within the bore 70 is a driven member or spindle, indicated generally at 74, which includes a tubular shaft part 76 and a head 78 at the rear end thereof. The spindle has a longitudinally extending bore 80 therethrough closed at the rear end by a plug 82 secured therein by press fitting or the like.

At the head end of the spindle and just behind said head 78 is a ball bearing assembly of well known character, indicated generally at 86, said bearing assembly being termed a floating bearing. This bearing includes an outer race 88, an inner race 90 and balls 92 therebetween. At the rear of the head 78 is a reduced diameter part 94 which is of greater diameter than the shaft part 76, the adjacent end of the inner race 90 of the bearing assembly 86 is slidable in the bore 70 and operably supports the rear end of the spindle 74.

The forward or free end of the angle housing part 14 has an externally threaded portion 98 for reception of an end cap 100. Cap 100 is hollow and has a rear end portion that has an internally threaded portion 102 at the forward end of which there is an inwardly extending annular shoulder 104 is smaller than the internal diameter of the bore 70 so as to form an abutment at the forward end of said bore 70.

Cap 100 has a forward extension 106 with an axial bore 108 therein. At the rear said bore 108 is enlarged as at 110 for slidable reception of a reduced diameter forward end portion 112 of the spindle shaft 76.

A bearing assembly 114 is disposed at the forward end of the bore 70 of the angle part 14 with the outer race abutting against the shoulder 104 of the cap 100, the rear end of the spindle shaft 76 being operably received in the inner race of said bearing assembly 114.

Between the floating bearing assembly 86 and the bearing assembly 114 are a pair of sleeves 120 and 122 having their adjacent ends spaced apart, said sleeves being slidable in the bore 70. The rear end of the forward or front sleeve 120 has an inwardly extending annular flange 124 the inside wall of which is spaced from the spindle shaft 17. The rear sleeve 122 has a similar flange 126 at the rear end thereof. Sleeves 120 and 122 have their flanged ends in abutment with the outer races of the respective bearing assemblies 86 and 114 and there is a coil spring 128 having its ends engaging the adjacent flanges of said sleeves.

Since forward sleeve 120 is held against forward movement by the bearing assembly 114 which in turn is held against forward movement by the shoulder 104, the rear sleeve 122 is urged rearwardly to yielding urge the head 78 of the spindle into operable engagement of the facing

48 of the driving head 46 and the spring 128 maintains the correct pressure on the driven head 78 for the optimum driving connection with the driving head.

The rear face of the head 78 of the spindle 74 is frustoconical with the rearwardly and inwardly inclined face 134 corresponding to the face 58 and operably engaging same. Thus the driving head and the driven head are urged into operable engagement by the spring 128.

The shaft part 76 of the spindle is provided with a plurality of longitudinally extending annularly spaced slots 136 which extend into the bore 80 thereof. The ends of these slots curve inwardly toward each other.

In each slot is a collet insert 138 having its ends with curves corresponding to the curve of the ends of the respective slots. When the collet inserts 138 are disposed in the slots the inner edge 140 of the inserts extend into the bore 80. Each insert has an elongated notch 142 defined at the ends by ears 144 and there is a resilient cylindrical spring 146 about the tubular shaft 76 of the spindle 74, said spring being received in the notches 142 of the collet inserts and urging same inwardly into seating engagement with the ends of the slots 136. When thus installed the spring portions between the collet inserts is pulled radially inwardly slightly and when the shank 148 of a burr or other tool is inserted into the bore 108 of the cap extension and into the bore 80 of the spindle shaft and pushed inwardly into engagement with the inner end of the plug 82 the collet inserts are engaged and forced outwardly slightly against the resistance of the cylindrical spring 146 the parts of said spring, between the collet inserts straightening out slightly as said inserts are forced outwardly. The spring exerts radially inward pressure on the inserts so that the burr shank is securely held in the bore 80. The burr shank is, however, removable from the bore 80 by pulling same outwardly.

There is means for attaching the device to driving means such as a pneumatic turbine, the forward part of which is shown in dotted lines and indicated by the reference numeral 150. At the forward end of the turbine is a forwardly shank 152 of reduced diameter and a collet 154 extends from the front end of said shank 152, said collet being of well known character and is adapted to have the stem of a burr or other stem or shaft removably inserted therein for an operable connection with said stem or shaft.

The rear, free end of the housing 12 has a plurality of longitudinally extending parallel slots 156 which are annularly spaced apart to provide a plurality of parallel flexible fingers 158 which have interior lugs 160 at the free ends thereof, said lugs having inwardly inclined tips 162 to facilitate insertion of the turbine shank.

On the outer side of the fingers are provided with longitudinally extending externally threaded portions 164, the threaded portions being sufficiently larger than the fingers to permit an annular, internally threaded nut 168 to be screwed thereon.

Outer free end portions of the fingers are inclined radially inwardly and toward the free ends as at 170 to provide cam surfaces engaged by an annular internal wedge 174 at the outer end of the nut 168. Thus when the nut 168 is screwed onto the threaded parts 164 the annular wedge 174 engages the cam surfaces 170 and forces the fingers 158 into tight engagement with the shank 152 of the turbine thereby securing the device on said turbine.

When the device is slipped onto the shank 152 of the turbine the shaft 40 of the drive shaft assembly is forced into the collet 154 of the turbine to provide an operable connection with the rotating part of the turbine.

There is an O-ring disposed in an internal groove 182 in the rear housing part, said O-ring securely holding the front part of the turbine shank 152 from vibrating.

The friction material on the head of the driving mem-

ber may be of any suitable character but the Johns-Manville friction material 240 has been found very satisfactory.

Referring to FIG. 4 there is shown an alternative arrangement for attaching the device to a pneumatic or other type of motor. The fingers 158 have lugs 244 adjacent their ends and lugs 246 adjacent their inner ends. The clamp means, indicated generally at 248, is of known character and comprises a flexible band 250 the ends of which are secured and drawn together by a screw 252. Tightening of the screw tightens the band on the flexible fingers 158 and the latter then tightly engage the turbine shank.

I claim:

1. Power transmitting means, including:

- (A) a hollow housing having a rear part and a front part extending forwardly at an obtuse angle to said rear part;
- (B) a rotatable drive shaft assembly including a body, a driving head at the front end of said body, and a shaft extending rearwardly from said head having a beveled edge portion at the front thereof;
- (C) bearing means in the housing in which the body of the drive shaft assembly is operably disposed;
- (D) a spindle in the front part of the housing, said spindle having a driven head and a shaft connected thereto with a longitudinal bore therein, said driven head having a beveled edge portion at the free face thereof operably related to the beveled edge portion of the driving head;
- (E) means operably mounting said spindle for rotative and longitudinal movement;
- (F) and resilient means urging the spindle in a direction to effect frictional engagement of the beveled edge portions of said heads; and
- (G) collet means associated with the spindle shaft for frictionally holding the shank of a tool inserted in the bore of said spindle shaft.

2. The invention defined by claim 1, wherein the means operably mounting the spindle for rotative and longitudinal movement comprises:

- (A) a front bearing at the forward end of the forward part of the housing held against forward movement and in which the spindle shaft is rotatably and slidably mounted; and
- (B) a rear bearing on said spindle shaft adjacent the front end of the driven head and engagable therewith, said rear bearing being slidable within the front part of said housing.

3. The invention defined by claim 2, wherein the resilient means urging the spindle in a direction to effect frictional engagement of the beveled edge portions of said heads comprises:

- (A) a spring disposed about the spindle shaft; and
- (B) a pair of axially aligned sleeves slidably disposed within the front part of the housing and inside the bore, adjacent ends of said sleeves being longitudinally spaced apart; and

(C) inwardly extending flanges at the remote ends of the sleeves, the ends of said spring reacting against said flanges;

(D) the front end of the front sleeve engaging the front bearing and the rear end of the rear sleeve engaging the rear bearing.

4. The invention defined by claim 3, wherein the spindle shaft has a plurality of longitudinally extending annularly spaced slots, the ends of the respective slots being inclined inwardly and toward each other,

(A) said collet means comprising collet inserts for the respective slots, the ends of said inserts normally seating on the oppositely inclined ends of the respective slots, said inserts having notches in their outer sides;

(B) and an annular spring encircling the spindle stem and operably received in the notches of the collet inserts yieldingly urging said inserts inwardly for frictional engagement with a stem of a tool inserted into the longitudinal bore in the spindle shaft.

5. The invention defined by claim 4 including means for securing the rear housing part to operating motor.

6. The invention defined by claim 2, wherein there is a hollow cap removably attached to the front end of the front housing part, an internal shoulder in said cap and the front bearing is held against forward movement by said shoulder, said cap having a passage therethrough in axial alignment with the longitudinal bore of said spindle shaft.

7. The invention defined by claim 1 wherein there is means for securing the rear part of the housing to a motor comprising a plurality of longitudinally extending fingers at the free end of said rear housing part, and extending over a part of said motor said fingers having cam surfaces thereon adjacent the free ends thereof, said fingers having external threads thereon, and a nut screwed onto the threaded parts of the fingers, said nut having an annular wedge part engagable with the cam surfaces for forcing said fingers into clamping engagement with said part of said motor.

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