July 20, 1965 H. W. K. ENCHELMAIER ETAL 3,195,159

QUICK-CHANGE MOUNTING ASSEMBLY

Filed Dec. 20, 1963 2 Sheets-Sheet 1

Fig 1

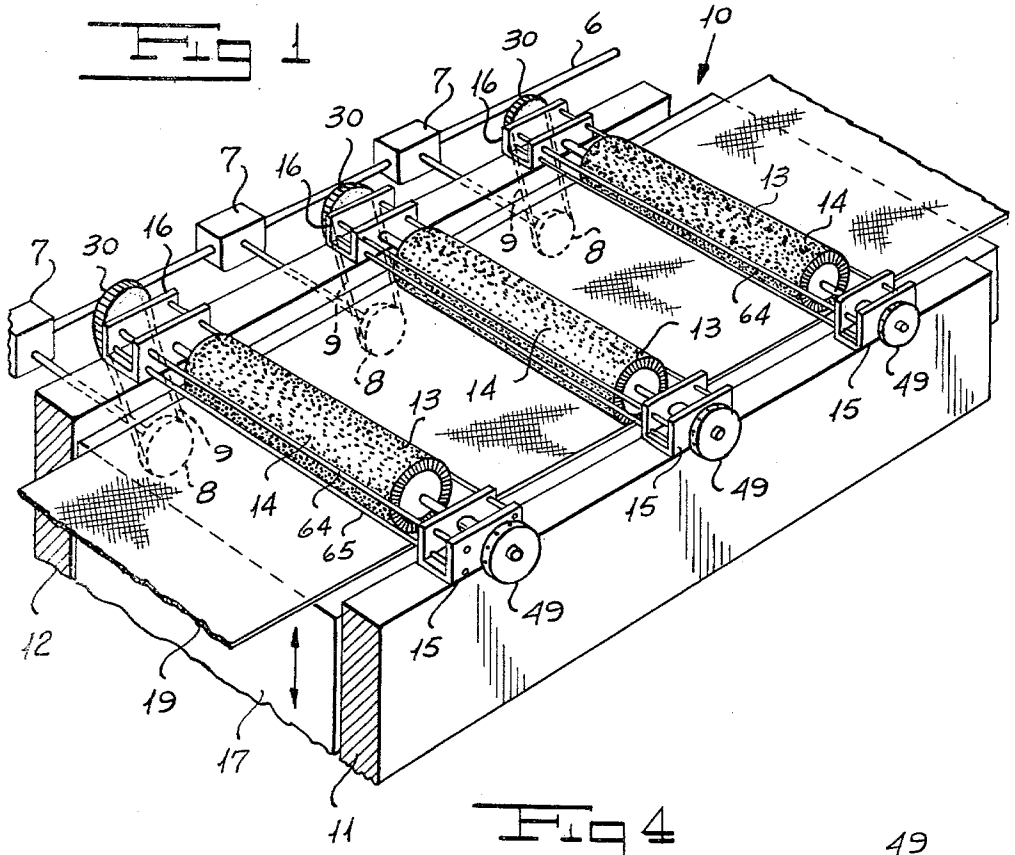



Fig 4

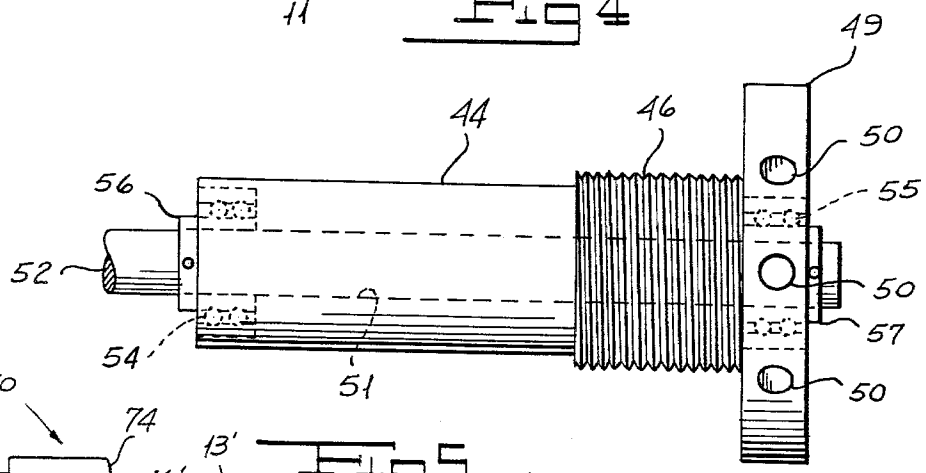
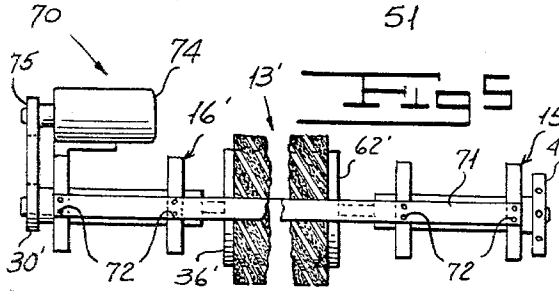



Fig 5




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QUICK-CHANGE MOUNTING ASSEMBLY

Filed Dec. 20, 1963 2 Sheets-Sheet 2

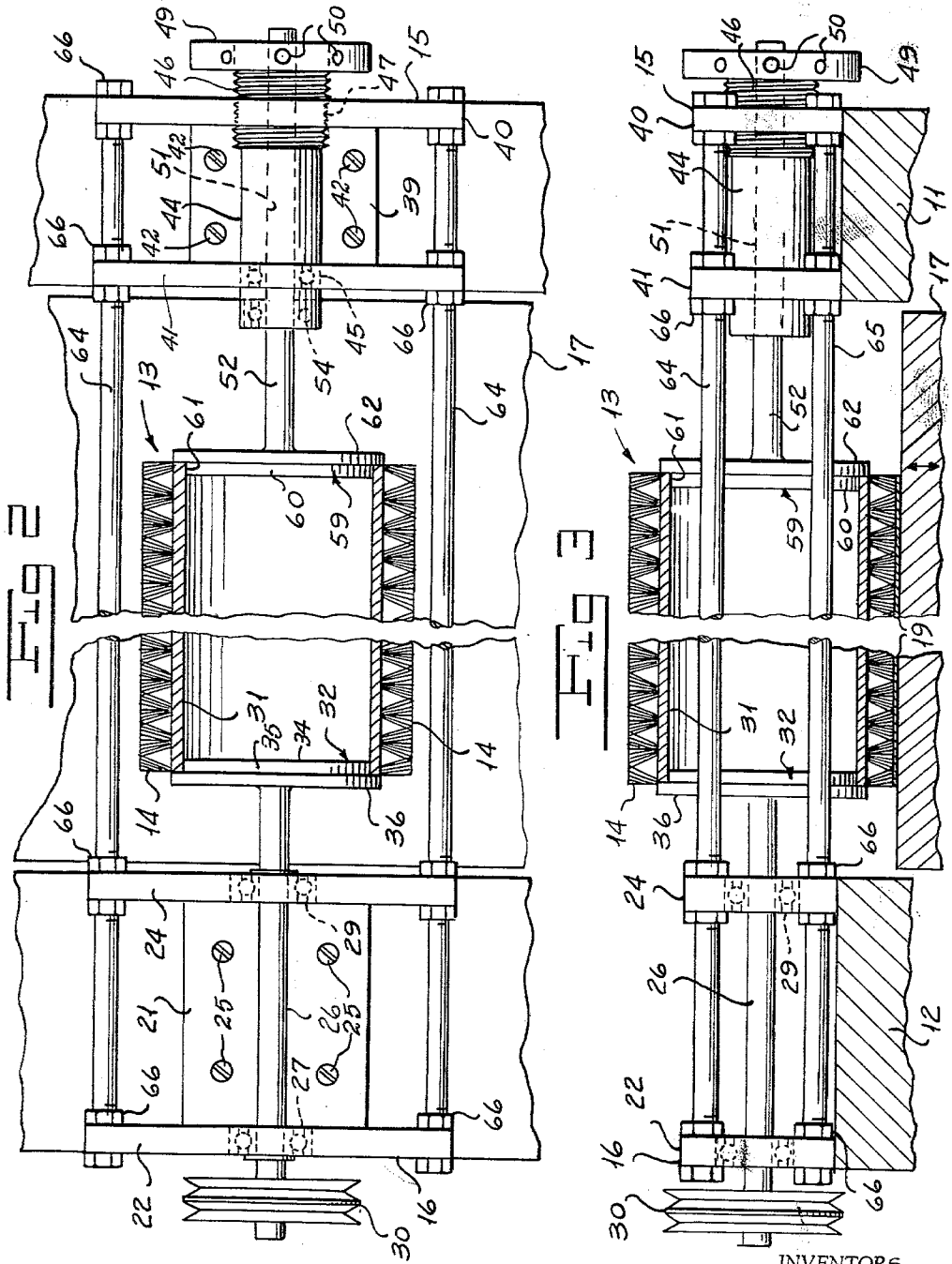


FIG 2

FIG 3

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United States Patent Office 3,195,159 Patented July 20, 1965



3,195,159

# QUICK-CHANGE MOUNTING ASSEMBLY

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Filed Dec. 20, 1963, Ser. No. 332,004
7 Claims. (Cl. 15—77)

This invention relates to a quick-change mounting assembly for elongated members or tools, such as brushes, rotating about their axes; although not limited thereto, the device of the invention is well adapted for mounting rotatable brushes in multiple brush industrial brushing machines.

The novel assembly of the invention displays its advantages particularly well in applications wherein it is necessary to substitute frequently changed members such as brushes which are held at both ends and are rotatably driven about their axes. The assembly includes means engaging the opposite ends of the rotatable member to support and center it, at least one of such means being driven. The assembly is such that such member-engaging means are held in permanent alignment, regardless of the presence or absence of the member, that is, the alignment of such means is independent of the driven member. As a consequence, in mounting a new member in the assembly all that is necessary is to engage the new member in a predetermined manner with the member-engaging means, there being no necessity for realigning such means at any time except after its own infrequent disassembly, as for maintenance and repair.

The mounting assembly of the invention may be employed to advantage as a self-contained unit having its own driving means, or as one of a number of units in a machine, such as that of FIG. 1 herein. Such latter use is first discussed herein. The assembly of the invention in an embodiment thereof wherein it is self-contained and unitarily driven is shown in FIG. 5.

Brush mounting devices heretofore available for use in multiple industrial brushing machines have been somewhat cumbersome, usually being of such construction that they must be partially disassembled to remove an old brush and to substitute a new brush in the machine. This operation requires that the entire machine be stopped and thus production curtailed. It has been proposed, in a brush mounting assembly for the purpose indicated, to employ a tension rod maintained centrally within the hollow arbor of the brush, the rod being placed under tension whereby to hold the brush mounting means disposed at opposite ends of the brush in compressive relationship with the brush arbor. With such latter construction, it was necessary to impose a very substantial tension upon the rod to provide a secure driving relationship between the brush arbor and at least one driven arbor-engaging means. The tension thus imposed upon the rod was frequently high enough to distort the arbor of the brush, to cause it to be sprung out of alignment, and thus to unbalance it. The rod within the brush arbor frequently added to the imbalance of the rotating brush and rod assembly; such condition is serious in high speed brushing machines, since it causes undue wearing of the bearings and a non-uniform brushing action by the out-of-balance brush.

The above previously outlined difficulties attendant upon the use of prior brush mounting devices are overcome by the brush mounting assembly of the present invention. In accordance with a preferred embodiment of such invention, the brush arbor, which is preferably hollow and has a circular cylindrical surface at each of its opposite ends, is compressibly engaged by the opposite disposed arbor-engaging means having inner frustro-conical portions of large apex angle which engage the outer ends of



such circular cylindrical portions of the arbor. Such oppositely disposed means, which will rotate coaxially of each other, thus serve accurately to align the brush arbor therewith. In the disposed preferred illustrative embodiment, one of such means is driven about its axis and is held from movement along its axis. The other such means is idle, being driven only by its engagement with the brush arbor, and is mounted for rotation about its axis and for adjustment along its axis. The two arbor-engaging means may thus be separated for the introduction of a brush therebetween, the movable arbor-engaging means then being advanced toward the other, fixed means so as to grip the brush arbor and center it in the manner described.

The brush mounting assembly, in it disclosed preferred embodiment, includes means such as tie rods extending between the means mounting the opposed brush arbor-engaging means, whereby to absorb all or at least a very substantial part of the thrust imposed upon the two arbor-engaging means by reason of their engagement with the brush arbor. In the illustrative embodiment, such tie rods are disposed symmetrically about the axis of the brush so that the brush arbor-engaging means are free from bending forces which might tend to distort them.

The invention has among its objects the provision of a novel simple tool mounting assembly which permits tools mounted thereby quickly to be changed.

The invention has among its objects the provision of a novel simple brush mounting assembly which permits brushes mounted thereby quickly to be changed.

Another object of the invention is the provision of a tool mounting assembly of the type indicated having oppositely disposed tool arbor-engaging means which are held in accurate alignment, and which in supporting and rotating the tool impose only straight-line axial forces upon the arbor of the tool.

A further object of the invention lies in the provision of a brush mounting assembly having novel brush arbor-engaging means which insure the initial mounting and maintenance of the brush during its operation in axial relationship therewith.

Yet another object of the invention is the provision of a brush mounting assembly, the opposite brush arbor-engaging means of which are connected to form an integral assembly which itself absorbs all of the forces arising from engagement of the brush arbor-engaging means of the mounting assembly with the brush arbor.

A still further object of the invention lies in the provision of a novel brush mounting assembly arrangement wherein the force between the two opposite brush arbor-engaging means thereof are symmertically countered by connecting means existing therebetween.

Yet another object of the invention is the provision of a mounting assembly of the type indicated which is self-contained, whereby the tool-engaging means thereof remain in accurate alignment at all times, independent of the support for the assembly.

The above and further objects and novel features of the invention will more fully appear from the following description when the same is read in connection with the accompanying drawings. It is to be understood, however, that the drawings are for the purpose of illustration only, and are not intended as a definition of the limits of the invention.

In the drawings, wherein like reference characters refer to like parts throughout the several views:

FIG. 1 is a fragmentary view in perspective of a multiple brush brushing machine, the brushes being shown arranged in tandem and operating upon a web of material passing therebelow;

FIG. 2 is a view in plan of one brush and the brush mounting assembly thereof employed in the machine of

FIG. 1, an intermediate portion of the brush and the brush mounting assembly being broken away for economy of space in illustration, fragments of the supporting rails of the machine being shown;

FIG. 3 is a view in side elevation of the brush and the brush mounting assembly therefor shown in FIG. 2, fragments of the rails of the machine being shown;

FIG. 4 is a view in plan of the idle brush arbor-engaging means of the brush mounting assembly of FIGS. 2 and 3, a forward portion of such arbor-engaging means being broken away; and

FIG. 5 is a view in side elevation on a reduced scale of a tool mounting assembly made in accordance with the invention, said assembly being shown employed as a self-contained, self-powered unit.

Turning now to the drawings, the portion of the brushing machine fragmentarily shown in FIG. 1 is designated generally by the reference character **10**. Such machine has a frame, a portion of which is shown, the frame having upstanding longitudinally extending parallel laterally spaced rails **11** and **12**. Rails **11** and **12** of the frame furnish support for a plurality of similar transversely disposed circular cylindrical driven brushes **13** having bristles **14**, the brushes being mounted in parallel relationship and extending across the span between rails **11** and **12**. Each of the brushes **13** is similarly mounted and driven, the end of each brush nearer the reader in FIG. 1 being supported in a sub-assembly **15** of the brush mounting assembly and the end of the brush **13** remote from the reader in FIG. 1 being mounted in a sub-assembly **16** thereof. In the embodiment shown, the brushes are disposed above a flat horizontal table **17** located between the rails **11** and **12**, such table being adjustable vertically toward and away from the brushes by means not shown. A web material such as cloth **19** is drawn by web pulling means not shown over the table **17** and beneath the brushes **13** so as to be acted by the bristles **14** of the several brushes in sequence.

The construction of the brush mounting assembly of the illustrative embodiment of the invention is more clearly shown in FIGS. 2, 3, and 4. As shown in FIGS. 2 and 3, the brush supporting means **16** has a generally U-shaped supporting bracket having a base **21** in the form of a flat plate which lies upon and is secured to the upper surface of the rail **12**. Connected to the opposite ends of base **21**, as by being welded thereto, are similar upstanding parallel outer and inner plate members **22** and **24**, respectively. The thus formed bracket is secured to rail **12** by studs **25**. A horizontal shaft **26** disposed transversely to the length of the machine **10** is journaled in the described bracket by means of a bearing **27** mounted in plate **22** and a bearing **29** mounted in plate **24**. Bearings **27** and **29** are thrust bearings which permit the shaft **26** freely to rotate about its axis while holding it from movement along its axis. Shaft **26** is rotatably driven as by means schematically shown in FIG. 1 including a driven shaft **6** extending longitudinally of the machine, a plurality of gear sets **7** connected to and driven by such shaft, and opposed pulleys, one designated **8** on the gear set and one designated **30** on shaft **26**, the pulleys being connected by belts **9** as shown.

Fixedly mounted on the inner end of shaft **26** is a first arbor-engaging means which is generally designated by the reference character **32**. Means **32** carries coaxially thereof on its inner end a smaller portion **34** having a frusto-conical surface **35** which converges at a small angle in a direction toward the longitudinal center of the machine. Outwardly of means **34** the device **32** has a disc-like portion **36**. The inner surfaces of the brush arbor at the ends thereof are in the form of circular cylinders coaxial of the arbor. The diameter of the larger end of portion **34** and means **32** is such that the part **34** may be advanced into the end of the hollow brush arbor **31** to the position shown in FIGS. 2 and 3 wherein the annular inner surface of portion **36** of means **32** accurately engages the end surface of the arbor. In such position of the brush-engaging part **34** such part accurately centers the left hand end of the arbor; part **36** holds the brush from further travel to the left. Parts **34** and **36** act in conjunction accurately to maintain such end of the brush in axial alignment with shaft **26** despite subjection of the brush to substantial endwise compression, imposed thereupon by the means **16**, **32** and the means **15** to be described, and by the subjection of the brush to radially directed forces arising from its interaction with the web **19** upon which it operates.



The device **15**, which supports the end of the brush arbor nearer the reader in FIG. 1, is likewise shown more clearly in FIGS. 2 and 3. Device **15** includes a generally U-shaped bracket having a base plate **39** and two upstanding parallel flange members the outer of which is designated **40** and the inner of which is designated **41**. The thus formed bracket is secured to the machine rail **11** by studs **42**, as shown. Flange members **40** and **41** serve to support a sleeve member **44** which is mounted in alignment with the abovementioned shaft **26**. For this purpose the inner flange **41** is provided with a smooth circular cylindrical bore **45** therethrough, such bore being coaxial with shaft **26**. Flange member **40** is provided with a threaded bore **46** which is aligned with bore **45** and a somewhat larger diameter. The sleeve **44** has the main portion of its outer surface of smooth circular cylindrical configuration, such portion of the sleeve being accurately slidably received within the bore **45** in member **41**.

At its rear, outer end sleeve **44** is of somewhat larger diameter than the main portion of the sleeve, such larger rear portion thereof being threaded so as to be threadedly received within the threaded bore **47** in member **40**. It will be apparent that upon turning the sleeve **44** in the appropriate direction the sleeve will be advanced toward or retracted from the brush arbor-engaging member **32** carried by the fixedly positioned shaft **26**. For this purpose the outer end of sleeve **44** is provided with a disc-like member **49** rigidly affixed thereto. Preferably member **49** is provided with a plurality of radially directed sockets **50** extending inwardly from its outer rim, the sockets being adapted to receive the inner ends of pin-like handles (not shown) when the sleeve **44** is to be adjusted.

The sleeve **44** has a central passage **51** extending therethrough, such passage receiving therewithin a coaxially mounted rotatable shaft **52**. Shaft **52** is mounted in sleeve **44** by means of a first anti-friction bearing **54** at the inner end of the sleeve and a second similar bearing **55** at the outer end of the sleeve. The outer races of such bearings are mounted in counterbores at the inner and outer ends of the sleeve as shown. The bearings are retained in place and endwise thrusts between the shaft **52** and the bearings and thus the sleeve **44** are absorbed by means of inner and outer stop collars **56** and **57**, respectively, on shaft **52**.

Affixed to the inner end of shaft **52** is a brush arbor-engaging member **59** which is similar to the above-described member **32**. Thus the member **59** is provided with an inner portion **60** which has a frusto-conical peripheral surface which converges in the direction towards the brush. Outwardly of portion **60** the member **59** is provided with radially outwardly extending flange **62**. As in the case of member **32**, member **59** is positioned so that its frusto-conical inner end portion telescopes within its respective end of the brush arbor, and so that the annular end surface of the brush arbor engages the forward annular surface of the flange **62**. The dimensions of member **59** are so related to those of the brush arbor **31**, and the apex angle of the frusto-conical surface **61** is such, that the frusto-conical portion engages the outer circular cylindrical surface within the brush arbor, thus accurately centering the arbor relative to member **62**. As with member **32**, the end engagement between the brush arbor and inner annular surface of

flange 62 serves further to steady the brush arbor and to hold it in accurate alignment during operation of the brush.

As above indicated, the preferred illustrative embodiment of the apparatus is provided with means whereby the machine frame as a whole is relieved from the necessity of countering the oppositely directed forces imposed upon members 32 and 59 by their compressive engagement with the brush arbor. For this purpose, the apparatus is provided with symmetrically disposed tension-sustaining members connected between the sub-assemblies 15 and 16. Specifically, such tension-sustaining members are in the form of four spaced parallel tie rods of which there are two upper rods 64 and two similar lower rods 65 disposed therebeneath. The rods 64 and 65 are located, in effect, at the respective corners of a rectangle, the common axis of the shafts 26 and 52 being located at the point of intersection of the diagonals of the rectangle. The tie rods 64 and 65 are secured to the upstanding flange members 22, 24, 40 and 41 by nuts 66 mounted on the threaded end portions of the rods, and having one nut disposed on each side of each of the plate members. The described symmetrical mounting of the tie rods and the brush supporting their rotating shafts insures that at all times the thrusts imposed upon the opposite ends of the brush arbor are in alignment with each other. As a result, the axial compressive forces imposed upon the described brush mounting sub-assemblies are isolated from the machine frame 10, and are countered entirely by the tension-sustaining tie rods between the sub-assemblies.

Although the above described embodiment of the invention incorporates driven brush arbor-engaging means which depends upon their frictional engagement with the brush arbor to drive the brush, it is apparent that in some instances other arbor-engaging means may be employed. Thus one or both ends of the brush arbor may be provided with one or more slots or grooves therein extending generally parallel to the axis of the brush arbor. The arbor-engaging means in such case would be provided with portions which accurately telescope over or into the ends of the arbor, in order to center the arbor, at least the driven arbor-engaging means additionally having one or more lands or ribs thereon which drivingly interfit with the slots or grooves in such end of the arbor. With such construction, the assembly is relieved of the necessity for thrusting the arbor-engaging means together forcibly enough to maintain an adequate frictional driving engagement between the driven arbor-engaging means and the arbor. In the described modified construction it is necessary only to thrust the arbor-engaging means together with sufficient force to center and secure the arbor, the turning of the arbor about its axis being effected by the described engagement between the one or more lands or ribs on the driven arbor-engaging means and the arbor.

A number of the advantages resulting from above-described embodiment of the invention have been set forth above. Still others will appear to those skilled in the art. Among them is the fact that the brush mounting assembly may be readily removed as a unit from the machine frame 10 when necessary, merely be removing the studs 25, 42, and the driving belt 9 for the assembly. A new brush mounting assembly can be mounted in the machine by the reverse of the same single operations, thereby requiring only a short period of stoppage of the machine. The work of repairing and adjusting a brush mounting assembly can thus be done in a workshop, away from the machine; the reassembled assembly, with the shafts 26 and 52 aligned and held in that condition by the tie rods, can then be simply reinstalled when needed in the brushing machine without disturbing the adjustment and alignment of the parts of the assembly.

As indicated above, a second embodiment of quick-change tool mounting assembly in accordance with the invention is shown in FIG. 5. Such assembly, as in the case of that shown in FIGS. 1–4, inclusive, is shown in connection with its use to support and rotatably drive a brush having an elongated arbor. The assembly of FIG. 5 is generally the same as that of FIGS. 1–4, inclusive, except that it is self-contained and powered. Consequently, parts in FIG. 5 which are the same as in FIGS. 1–4, inclusive, are designated by the same reference characters but with an added prime.

The unit of FIG. 5, which is generally designated by the reference character 70, is portable and self-contained and driven, and thus may be mounted and employed in a wide variety of manners. The undriven, right hand brush support 15′ and the driven, left hand brush support 16′ of the assembly 70 are rigidly connected by two parallel longitudinally extending tie members, of which one is shown at 71, such tie members being disposed on opposite sides of supports 15′ and 16′ and being connected to the transverse plate members thereof by studs 72.

The shaft and arbor-engaging means associated with the support 16′ are driven by an electric motor 74 mounted on a suitable bracket secured to support 16′. Motor 74 drives such shaft and arbor-engaging means through a pulley 75 on the motor shaft, a pulley 30′ on the shaft of the driven arbor-engaging means, and a belt 9′ entrained over pulleys 30′ and 75. The parallel tie members, of which one is shown at 71, hold the supports 15′ and 16′ in rigid alignment, independent of the presence or absence of a brush 13′ in the assembly 70.

Although a limited number of embodiments of the invention have been illustrated in the accompanying drawings and described in the foregoing specification, it is to be especially understood that various changes, such as in the relative dimensions of the parts, materials used, and the like, as well as the suggested manner of use of the apparatus of the invention may be made therein without departing from the spirit and scope of the invention will now be apparent to those skilled in the art.

What is claimed is:

1. A mounting assembly for an elongated brush rotatably driven about its axis, said brush having an axially extending arbor, opposed aligned members for engaging and supporting the opposite ends of the arbor, means for mounting one of said members for rotation about its axis while retaining it from movement along its axis, means for mounting the other of said members for rotation about its axis including means for adjusting the other of said members along its axis selectively to advance said other member toward and retract it from said one member, spaced supports for the aligned rotatable means, elongated tie members extending between and connected to the supports to maintain the supports exteriorly of the brush in alignment and at a predetermined distance from each other, and means for driving at least one of said members and thus the brush and the other of said members.

2. A mounting assembly for a rotatable driven brush as claimed in claim 1, wherein the means for mounting the other said member comprises one of said supports, said one support being fixed, a sleeve disposed coaxial of said other member mounted on the said fixed support for adjustment toward and away from the said one member, a shaft connected to the said other member coaxially thereof, and means rotatably mounting the shaft in the sleeve and retaining it from axial movement with respect thereto.

3. A mounting assembly for an elongated brush rotatably driven about its axis, said brush having an axially extending arbor, opposed aligned members for engaging and supporting the opposite ends of the arbor, means for mounting one of said members for rotation about its axis while retaining it from movement along its axis, means for mounting the other of said members for rotation about its axis including means for adjust-

ing the other of said members along its axis selectively to advance said other member toward and retract it from said one member, spaced supports for the aligned rotatable means, elongated tension sustaining means extending between and connected to the supports exteriorly of the brush to maintain the supports in alignment and at a predetermined distance from each other, and means for driving at least one of said members and thus the brush and the other of said members.

4. A mounting assembly for a rotatable driven brush as claimed in claim 3, wherein the means for mounting the other said member comprises one of said supports, said one support being fixed, a sleeve disposed coaxial of said other member mounted on the said fixed support for adjustment toward and away from the said one member, a shaft connected to the said other member coaxially thereof, and means rotatably mounting the shaft in the sleeve and retaining it from axial movement with respect thereto.

5. A mounting assembly for a rotatable driven brush as claimed in claim 4, wherein the said fixed support has a first circular cylindrical passage portion and an aligned second threaded passage portion, the two passage positions being disposed coaxial of the two arbor-engaging members, and the sleeve has a first circular cylindrical portion accurately slidably received in first passage portion and a second threaded portion threadedly received within the second passage portion, and thrust bearing means disposed between the sleeve and the shaft, the said other arbor-engaging members mounted thereon, and the sleeve being adjustable as a whole toward and away from the said one arbor-engaging member by rotation of the sleeve.

6. A mounting assembly for a rotatable driven brush as claimed in claim 1, wherein the tie members are similar, and are disposed symmetrically about the common axis of the opposed rotatable members.

7. A mounting assembly for an elongated brush rotatably driven about its axis, said brush having an axially extending arbor, opposed aligned members for engaging and supporting the opposite ends of the arbor, means for mounting one of said members for rotation about its axis while retaining it from movement along its axis, means for mounting the other of said members for rotation about its axis while permitting its adjustment along its axis selectively to advance said other member toward and retract it from said one member, spaced supports for the aligned rotatable means, elongated tie members extending between and connected to the supports to maintain the supports in alignment, means for driving at least one of said members and thus the brush and the other of said members, the means for mounting the other said member comprising one of said supports, said one support being fixed, a sleeve disposed coaxial of said other member mounted on the said fixed support for adjustment toward and away from the said one member, a shaft connected to the said other member coaxially thereof, and means rotatably mounting the shaft in the sleeve and retaining it from axial movement with respect thereto, said fixed support having a first, circular cylindrical passage portion and an aligned second threaded passage portion, the two passage positions being disposed coaxial of the two arbor-engaging members, and the sleeve has a first circular cylindrical portion accurately slidably received in first passage portion and a second threaded portion threadedly received within the second passage portion, and thrust bearing means disposed between the sleeve and the shaft, the said other arbor-engaging members mounted thereon, and the sleeve being adjustable as a whole toward and away from the said one arbor-engaging member by rotation of the sleeve.

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