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MOTOR HAND TOOL ASSEMBLY

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2 Sheets-Sheet 1

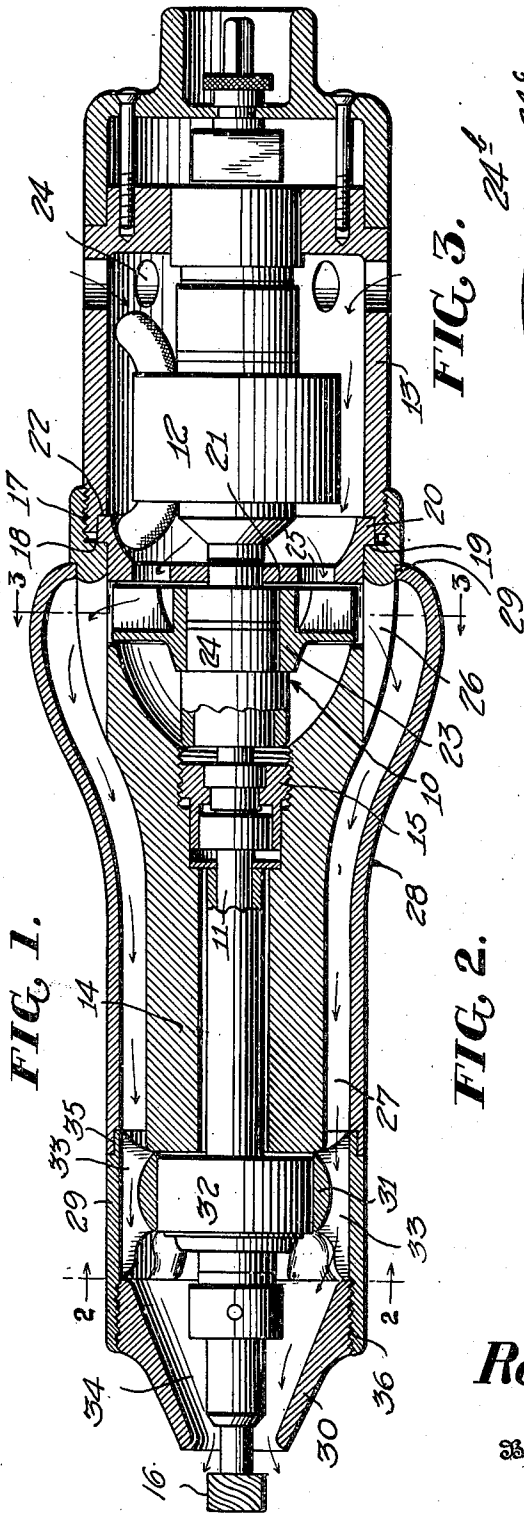
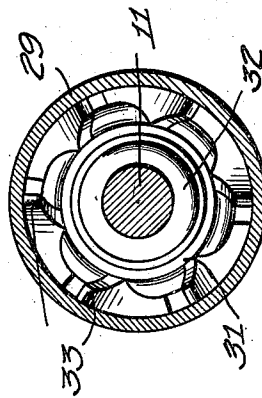
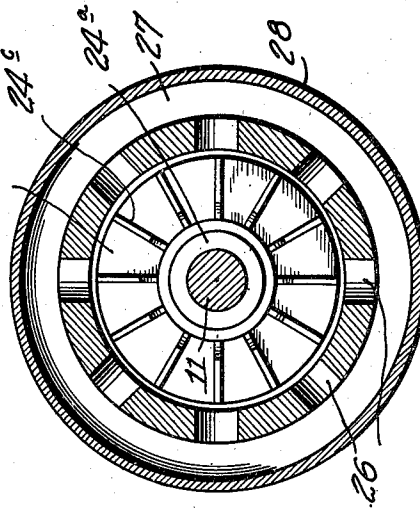


FIG. 1.

FIG. 2.



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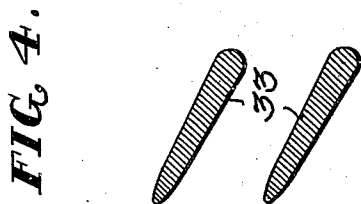
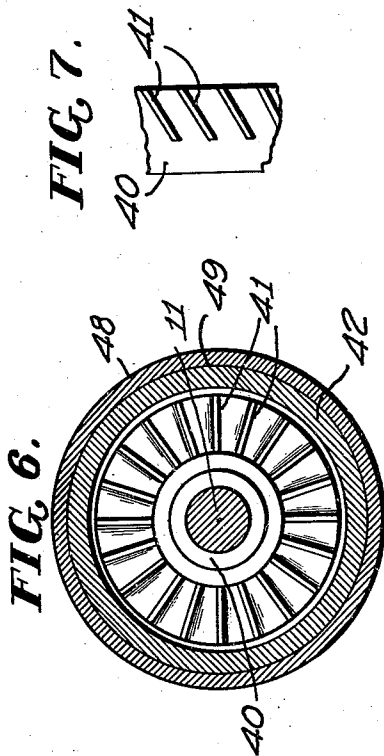
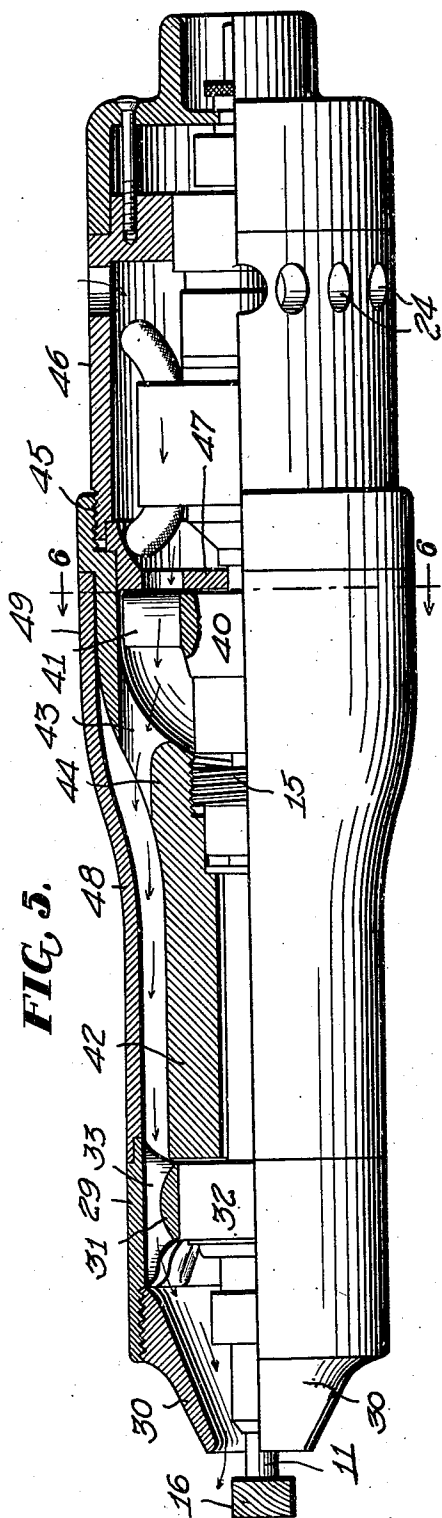
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2 Sheets-Sheet 2



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MOTOR HAND TOOL ASSEMBLY

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16 Claims. (Cl. 172-36)

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This invention relates to a hand tool assembly of the type operated electrically, pneumatically, by steam or otherwise, and which has a rotatable or equivalent movable part.

It is a prime object to provide means for mounting and handling of the tool part having one or more passages therethrough for induction of fluid, usually air, by a device driven by said rotary or other movable part.

A second object is to provide for the discharge of the air after passage through the assembly, at the working zone of the tool proper to perform the additional function of blowing away or removing detritus such as chips, dirt and dust in order to greatly facilitate observation of the work at all times and to expedite operation of the tool generally.

Another important aim is to provide means to augment the pressure and volume of the air or other fluid employed to impart whirling action thereto at the desired point or points of the assembly so as to increase the cooling action and localize such action wherever desired in or along the assembly.

A further object is to provide such an assembly operated by a motor having a casing about the same, to which a tubular structure is detachably secured and which provides a passage or passages for the travel of air or other fluid induced by a fan-driven from the motor and located within the tubular structure.

Still further, the invention provides a simple, inexpensive, sturdy and durable construction having the parts suitably enclosed and devoid of exterior projections such as would interfere with manual grasping and handling of the assembly.

The more specific objects and advantages will in part be pointed out hereinafter and otherwise become apparent from a consideration of the description following taken in connection with the accompanying drawings illustrating operative embodiments by way of example.

In said drawings:

Figure 1 is a view partly in elevation and partly in central longitudinal section through a hand tool assembly constructed in accordance with the invention;

Figure 2 is a cross sectional view taken on the plane on line 2-2 of Figure 1;

Figure 3 is a cross sectional view taken on the plane of line 3-3 of Figure 1;

Figure 4 is a fragmentary longitudinal section taken longitudinally of air-deflecting vanes used in the air passage of the tool;

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Figure 5 is a view partly in elevation and partly in central longitudinal section through a modified form of the hand tool;

Figure 6 is a cross sectional view taken on the plane of line 6-6 of Figure 5; and

Figure 7 is a fragmentary edge elevation of the impeller employed in the form of Figure 5.

Referring specifically to the drawings wherein like reference characters designate like or similar parts throughout the different views and first to the form of the invention illustrated in Figures 1 to 4, 10 generally designates a tool adapted to be held manually in operation and which includes a rotatable shaft 11, a motor 12 in driving relation with said shaft, a casing or housing 13 in which the motor 12 is located, and a spindle head 14 in which the shaft 11, for the most part, is journaled. The shaft 11 and associated parts are held against accidental detachment from the spindle head 14, for example, by a screw-threaded element 15. Shaft 11 is shown as having a suitable tool element 16 detachably mounted thereon which is to be considered as representative or conventional as it may be a grinding wheel, cutting tool, router, drill or otherwise.

The parts described are to be taken as conventional. Usually the motor 12 is an electric motor but it may represent any other type, for instance, a pneumatic motor, one operated by steam, or otherwise, and the shaft 11 specifically is shown as rotatable so that its motion will be imparted to the tool 16.

In carrying out my invention, the spindle head 14 is detachably screw-threaded at 17 to the motor housing and it is provided with an interiorly extending shoulder at 18 to abut a shoulder at 19 on an outwardly extending flange 20 of a partition plate 21 which serves as a mounting or bearing for shaft 11 or part rotatable therewith. Flange 20 occupies a cut-out portion in the inner edge of the motor housing 13 so as to abut a shoulder 22 on the latter. In this manner, it will be realized that the tool proper with the spindle 14 and partition 21 may be detachably removed and applied to the housing.

In order to induce the passage of air or other fluid around the motor 12 and associated parts and around the spindle head and tool 16, an impeller or fan element 23 is fastened on a collar 24 rigid with the shaft 11 so as to be rotatable therewith. Impeller 23 will induce air from the atmosphere into the housing 13 through openings 24, around the motor 12, through openings 25 in the partition plate 21 and then through openings

26 in the spindle head adjacent the rear end, which air then travels over the exterior of the spindle head 14 and discharges adjacent the tool 16. It will be understood that the impeller or vane 23 can assume various forms. As shown, it has a hub 24^a surrounded by an integral outwardly extending flange or web 24^b and blades or vanes 24^c radially disposed and extending rearwardly and longitudinally from the web 24^b.

It is preferable to confine the air against the exterior of the spindle head through one or more passages 27 preferably provided by employing a tubular shell or the like at 28 in surrounding but spaced relation to the spindle head 14. This shell may be press-fitted or otherwise tightly secured at its rear edge 29 to the spindle head 14.

Shell 28 also includes a section 29 and a section 30. Section 29 has an interior ring 31 effectively mounting an enlarged portion 32 of the enclosure for the shaft 11. Between ring 31 and the outer wall of the section 29 a plurality of ribs or vanes 33 are formed, for instance, six as shown although any desired number may be used, which are preferably angularly arranged as suggested in Figure 4 and which also are of streamlined cross section. These vanes 33 deflect the air in its passage through the structure, giving it a whirling action, and directing it into the conical interior hollow space 34 of the shell section 30. This action is extremely effective especially due to the high pressure and volume of the air set in motion by the impeller or vane 23.

It will be noted that the air or cooling fluid is discharged at the zone of the tool 16 and as a result performs the second function of blowing detritus away from the tool in order to enable its operation to be observed at all times and accordingly expedite the operation of the assembly generally.

Attention is called to the fact that although section 29 of the shell is shown as press-fitted at 35 to section 28, it may be made integral therewith and also that while section or nozzle 30 is shown separable from the section 29 by screw threads at 36, it may be made integral with the section 29 and the latter integral with the section 28. In the aforesaid form of the invention, spindle head 14 is preferably outwardly enlarged or bulged at its rear end portion and the shell 28 is approximately similarly shaped. This affords a very effective hand grip for the manual holding and manipulation of the tool.

A modified form of the invention as shown in Figures 5 to 7 differs from the first form primarily in that the passage of the air or cooling fluid is more direct than in the first form. In this modified form the impeller is designated 40, functions like that used at 23 but is of slightly different form in that it has peripheral vanes or blades 41 angularly or tangentially disposed. A spindle head 42 is employed in lieu of that at 14 having air openings 43 therethrough extending longitudinally rather than laterally in the first form and preferably through the bulge or enlargement at 44, adjacent the rear end.

Like in the first form of the invention, spindle head 42 is screw-threaded at 45 to a motor housing 46 and is shaped like the corresponding portions of spindle head 14 in order to secure a partition plate 47 identical with that at 21 in place. A shell 48 performs the function of that used at 28 but is less bulged at its rear end portion than the shell 28 but is preferably press-fitted as at 49 onto the spindle head 42. Associated with shell 48 are sections 29 and 30, identical with those of

the same numerals employed in the first form of the invention and which, if desired, may be made integral with each other and integral with the shell 48. Otherwise the structure conforms exactly to that of the first form of the invention and similar reference characters have been applied.

In this modified form of Figures 5, 6 and 7, the functioning and operation of the parts is the same as in the first form except that the induced air follows in its passage to the vanes 33, a practically straight course after entering the openings 24, as contrasted with the addition of a lateral deflection of such air in the first form radially of the impeller 23 and through the openings 26 of the shell.

Various changes may be resorted to provided they fall within the spirit and scope of the invention.

What is claimed is:

1. A tool assembly including an operating shaft, a motor to operate said shaft, means operable by one of said parts to induce air to travel in heat-transferring relation to the assembly and discharge adjacent the tool-operating end of the assembly and means for imparting whirling action to the air at a point adjacent its discharge from the assembly.

2. A tool assembly including an operating shaft, a motor to operate said shaft, a housing for said motor, means carried by the housing for handling the assembly, means within the last mentioned means operable with the motor and shaft to induce air through the assembly between the first-named means and shaft in heat-transferring relation thereto and mean for imparting whirling action to the air at a point adjacent its discharge from the assembly.

3. A tool assembly including a motor, a housing for said motor, a tool operating shaft driven by the motor, a spindle head about the shaft and extending from the housing, an impeller operable by said shaft to induce air around the motor, said spindle head being open at the end spaced from said motor for discharge of the air therethrough and means for imparting whirling action to the air at a point adjacent its discharge from the assembly.

4. A tool assembly including a motor, a housing for said motor, a tool operating shaft driven by the motor, a spindle head about the shaft and extending from the housing, an impeller operable by said shaft to induce air around the motor, said spindle head being open for discharge of the air therethrough, and means to confine the air passing through said openings around the spindle head and means for imparting whirling action to the air at a point adjacent its discharge from the assembly.

5. A tool assembly including a motor, a housing for said motor, a tool operating shaft driven by the motor, a spindle head about the shaft and extending from the housing, an impeller operable by said shaft to induce air around the motor, said spindle head being open for discharge of the air therethrough, means to confine the air passing through said openings around the spindle head and discharge the air adjacent the tool-operating end of the shaft and means for imparting whirling action to the air at a point adjacent its discharge from the assembly.

6. A tool assembly including a motor, a housing for said motor, a tool operating shaft driven by the motor, a spindle head about the shaft and extending from the housing, an impeller operable

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by said shaft to induce air around the motor, said spindle head being open for discharge of the air therethrough, means to confine the air passing through said openings around the spindle head and discharge the air adjacent the tool-operating end of the shaft, and air-deflecting means in the passage for the air at the outlet end of the passage.

7. A tool assembly including a motor, a housing about the motor open to the atmosphere, an operating shaft driven by the motor, a spindle head disposed about the shaft and extending from said housing, a perforated partition plate secured in place between the housing and spindle head, said spindle head being open, and an impeller located in the spindle head and operated by said shaft.

8. A tool assembly having a motor, a housing about said motor open to the atmosphere, an operating shaft extending from the motor, a spindle head surrounding the operating shaft and detachably secured to said housing, shoulders on the housing and spindle head, a perforated partition plate clamped between said shoulders and through which the shaft passes, an impeller on said shaft within the spindle head, and said spindle head being open for passage of air therethrough.

9. A tool assembly having a motor, a housing about said motor open to the atmosphere, an operating shaft extending from the motor, a spindle head surrounding the operating shaft and detachably secured to said housing, shoulders on the housing and spindle head, a perforated partition plate clamped between said shoulders and through which the shaft passes, an impeller on said shaft within the spindle head, said spindle head being open for passage of air therethrough, and a shell surrounding the spindle head and carried by the latter.

10. A tool assembly having a motor, a housing about said motor open to the atmosphere, an operating shaft extending from the motor, a spindle head surrounding the operating shaft and detachably secured to said housing, shoulders on the housing and spindle head, a perforated partition plate clamped between said shoulders and through which the shaft passes, an impeller on said shaft within the spindle head, said spindle head being open for passage of air therethrough, a shell surrounding the spindle head and carried by the latter, a ring member within the shell adjacent the outer end thereof and through which the spindle head passes, deflecting vane means between the ring member and outer wall of the shell, and said shell being constricted and having its outlet adjacent the tool-operating end of the shaft.

11. A tool assembly having a motor, a housing about said motor open to the atmosphere, an operating shaft extending from the motor, a spin-

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dle head surrounding the operating shaft and detachably secured to said housing, shoulders on the housing and spindle head, a perforated partition plate clamped between said shoulders and through which the shaft passes, an impeller on said shaft within the spindle head, said spindle head being open for passage of air therethrough, said impeller having an outwardly extending wall, vanes extending radially from said wall, and the openings of the spindle head being disposed peripherally about said vanes.

12. A tool assembly having a motor, a housing about said motor open to the atmosphere, an operating shaft extending from the motor, a spindle head surrounding the operating shaft and detachably secured to said housing, shoulders on the housing and spindle head, a perforated partition plate clamped between said shoulders and through which the shaft passes, an impeller on said shaft within the spindle head, and said spindle head being open for passage of air therethrough, said impeller having peripheral vanes disposed angularly, and the openings of said spindle head being laterally opposite said vanes.

13. A tool assembly having a motor, a housing for the motor, an operating shaft extending from the motor, a shell for handling the assembly surrounding the shaft and means on the shaft for inducing a current of air through the housing and longitudinally of the shell with the air escaping from the shell at the end of the shaft spaced from the motor.

14. A tool assembly as in claim 13, wherein a spindle head surrounds the shaft inwardly of the shell to form a bearing for the shaft with the air flowing between the spindle head and shell.

15. A tool as in claim 13, wherein a spindle head surrounds the shaft inwardly of the shell to form a bearing for the shaft, said spindle head having radial openings therein adjacent the air current producing means whereby the flow of air is first radially against the shell and then longitudinally thereof.

16. A tool as in claim 13, wherein a spindle head surrounds the shaft inwardly of the shell to form a bearing for the shaft, said spindle head having openings therein laterally of the air current producing means with the axes of said openings extending longitudinally of the spindle head and shell whereby the flow of air is directly longitudinally of the shell.

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