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Drzewiecki

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[54] **MULTIPURPOSE HAND TOOL**

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[51] **Int. Cl.²** **B24B 23/00**

[58] **Field of Search** ..... 51/170 R, 170 PT, 170 J, 51/206 P, 266, 356; 15/23, 230.1

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[57] **ABSTRACT**

A hand-held multipurpose tool includes an elongated handle fixed to and axially-aligned with a frame, about which is rotatably mounted a tubular housing having finishing means thereon for finishing a surface. A motor is mounted on the frame within the housing for rotating axially the housing relative to the frame. The motor has an output shaft drivingly connected to the housing and to a tool attaching member disposed at the outside of the front end portion of the housing, the member being adapted to receive and drive an auxiliary tool, such as a drill bit. The finishing means on the housing may be used for sanding or buffing the surface, and radial openings are provided in the tubular housing to permit air to be drawn past and into contact with the motor for cooling purposes by a fan blade and to enable the air to be driven through the openings and radially outwardly through the porous finishing means to remove continuously sanding or buffing residue.

10 Claims, 12 Drawing Figures

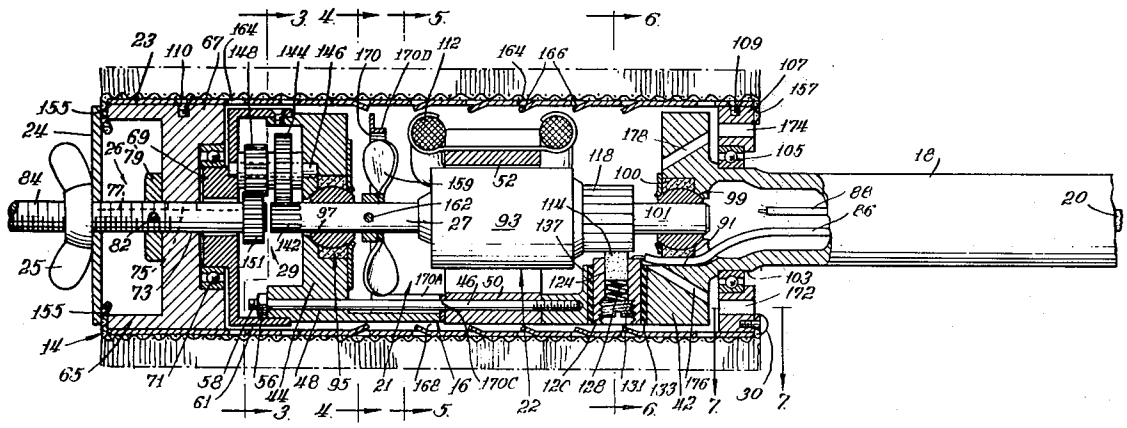


Fig. 1

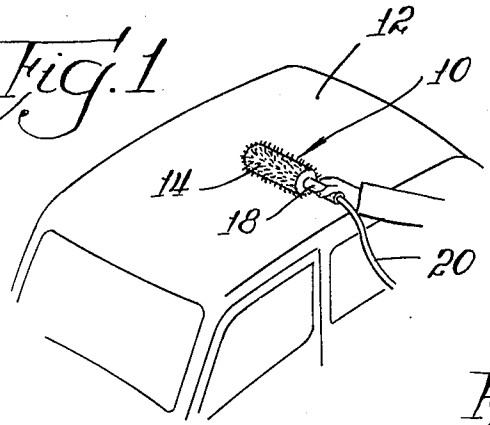


Fig. 9

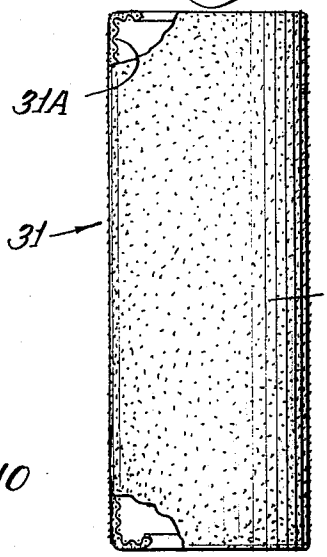


Fig. 10

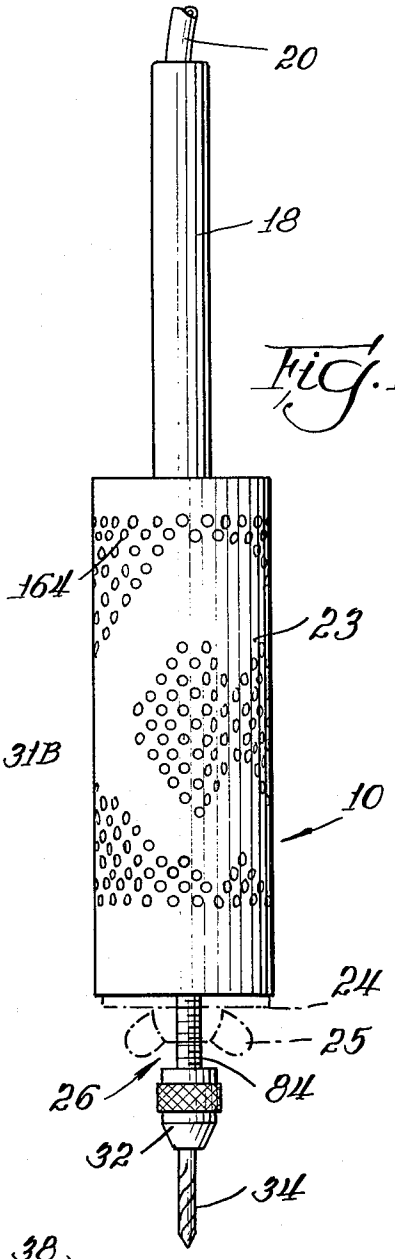


Fig. 11

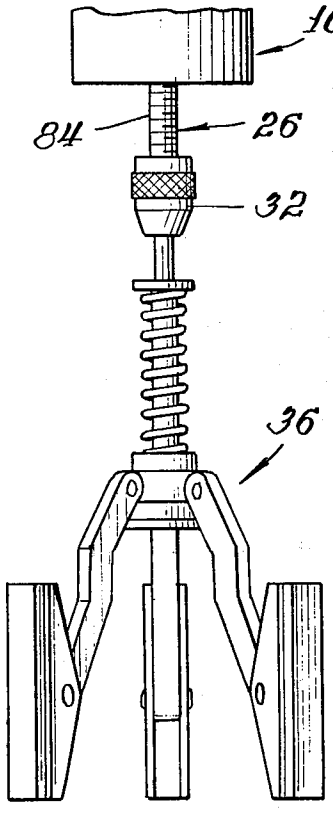
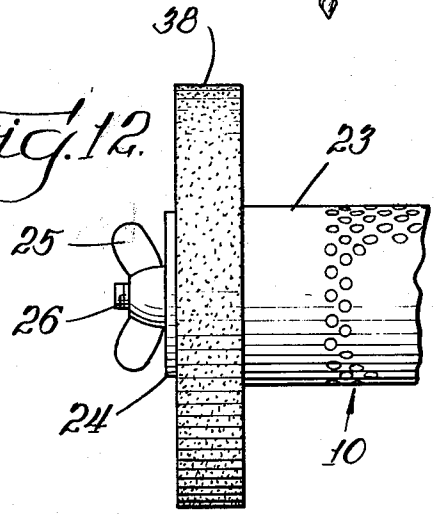
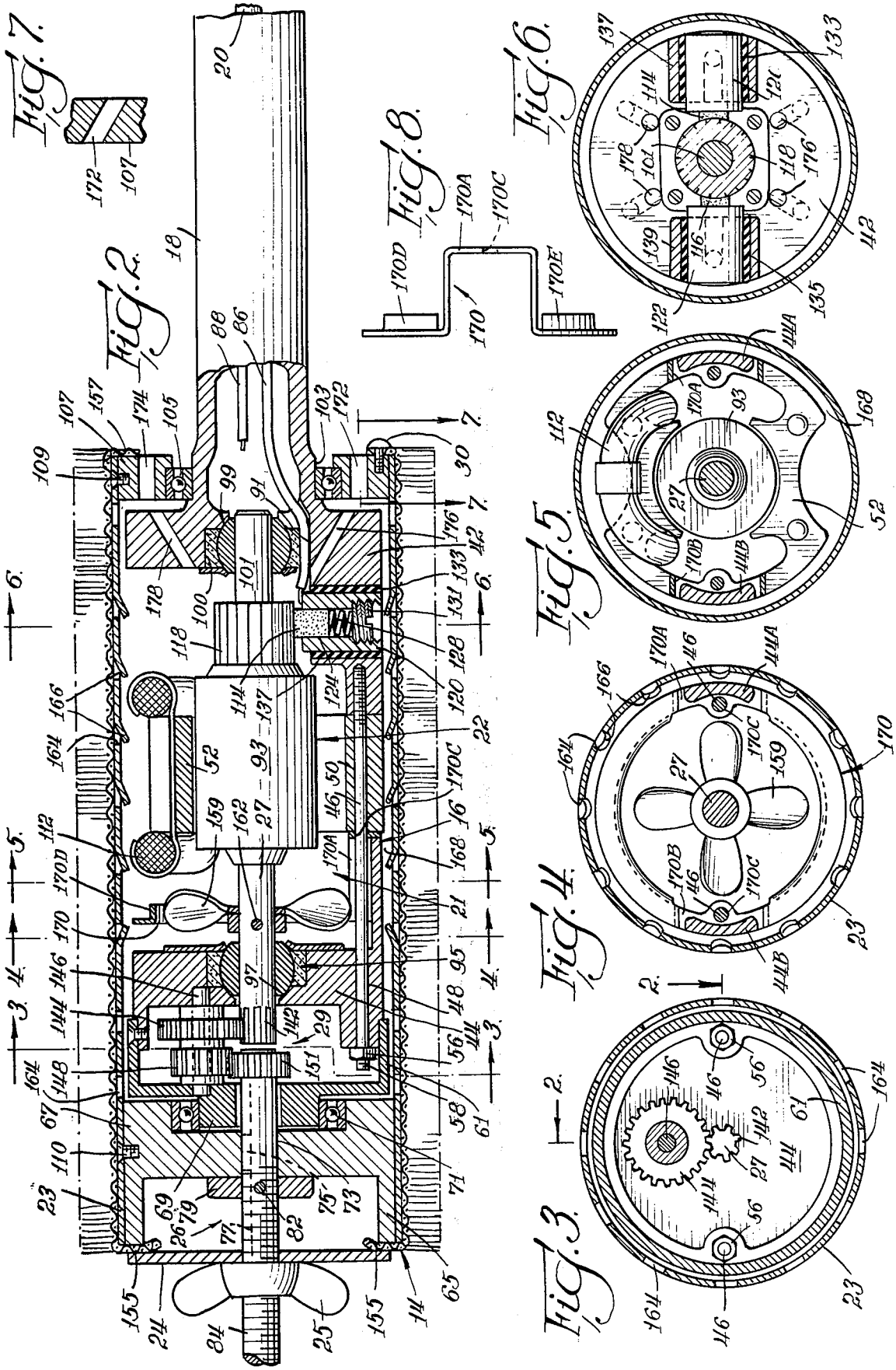


Fig. 12




Fig. 1
Fig. 2
Fig. 3
Fig. 4
Fig. 5
Fig. 6
Fig. 7
Fig. 8

MULTIPURPOSE HAND TOOL

The present invention relates to a multipurpose hand-held tool, and it more particularly relates to a hand-held tool which may serve as a buffer, sander, drill or other type of power tool.

Multipurpose hand tools have been employed so that the user can conveniently perform different types and kinds of tasks in a convenient manner with a single tool. For example, in U.S. Pat. No. **1,438,443** to Lieberherr et al, there is disclosed a hand tool which includes an electric motor mounted within a driven shell and having a pair of axially aligned handles, whereby the user may hold the two handles with his hands and the motor drives the shell rotatably mounted and axially aligned between the two handles for spraying water by centrifugal force to clean walls or perform other such work. A set of gears and a gear shift are provided to enable the one handle to be driven so that an additional tool, such as a drill bit may be secured thereto, whereby after shifting the gears, the user may support the tool by holding one handle and grasping the shell to maintain it in a stationary position with the other hand so that the motor can drive the other handle with the drill bit attached thereto. However, such a multipurpose tool is not at all convenient to use in that the user must hold the tool with two hands and thus such a tool may not be conveniently used to reach certain remote locations. As an example, it would be highly desirable to have such a multipurpose tool which serves to buffer the outer surface of an automobile roof when waxing it in such a manner that the user can readily and conveniently position the tool at a distance from himself in operating engagement with the surface to be buffed. Similarly, it would be highly desirable to have such a multipurpose tool which could be used to drive auxiliary tools, such as drill bits, without the necessity of requiring the user to hold the multipurpose tool with two hands in an awkward manner as in the U.S. Pat. No. **1,438,443.** Also, such a multipurpose tool should be simplified to use and inexpensive to manufacture, and in this regard, it would be desirable to eliminate the necessity of providing a gear shift mechanism.

Accordingly, the principle object of the present invention is to provide a new and improved multipurpose tool, which does not require the user to support the tool in two hands in an awkward manner, and which does not need a gear shift mechanism to shift between one set of gears for one use and another set of gears for another use.

Briefly, the above and further objects of the present invention are realized by providing a multipurpose tool including a single elongated handle adapted to be grasped by a hand of the user to support completely the tool, and having a driving means mounted on a frame fixed to the handle within a tubular housing surrounding and axially aligned with the frame, the housing being adapted to finish a surface. The housing is rotatably mounted on the frame to rotate axially relative thereto, and an output shaft of the driving means is connected drivingly to the housing for rotating it about its axis. A free distal end portion of the shaft extends forwardly and is adapted to receive and to drive an auxiliary tool, such as a drill bit. A plurality of radially-extending openings extend through the tubular housing, and a fan is drivingly coupled to the output shaft for blowing air radially outward through the openings

to remove any residue from the finishing of the surface, such as powdered residue produced during polishing and buffing during the waxing of the surface to be finished. A closure member at the rear end portion of the housing is provided with a plurality of holes extending therethrough to permit air to be drawn through the holes past and into contact with the driving means for cooling it by means of the fan.

These and other important objects and advantages of the invention will be more fully understood upon a reading of the following specification taken in view of the attached drawings, wherein:

FIG. **1** is a pictorial view of the multipurpose hand tool constructed in accordance with the present invention and showing it in one of its uses;

FIG. **2** is a compound elevational view of the tool of FIG. **1,** illustrating it with portions thereof broken away for sake of clarity;

FIG. **3** is a cross-sectional view of the tool of FIG. **2** taken substantially along the line **3—3** thereof;

FIG. **4** is a cross-sectional view of the tool of FIG. **2** taken substantially along the line **4—4** thereof;

FIG. **5** is a cross-sectional view of the tool of FIG. **2** taken substantially along the line **5—5** thereof;

FIG. **6** is a cross-sectional view of the tool of FIG. **2** taken substantially along the line **6—6** thereof;

FIG. **7** is a cross-sectional view of a detail of the tool of FIG. **2** taken substantially along the line **7—7** thereof;

FIG. **8** is a side view of a guide of the tool of FIG. **2;**

FIG. **9** is an elevational view of another attachment for the tool of FIG. **2,** portions thereof being broken away for illustration purposes; and

FIGS. **10, 11** and **12** show the tool of FIG. **2** being utilized for other purposes.

Referring now to the drawings, and more particularly to FIGS. **1–8** thereof, there is shown a multipurpose hand tool **10,** which is constructed in accordance with the present invention, and which is shown in FIG. **1** being used as a buffer for polishing and buffing the roof of an automobile **12** during the waxing thereof. As shown in FIG. **1,** the tool **10** may be supported with one hand by the user and can be conveniently used to finish a surface, such as the roof of the automobile **12,** by enabling the user to reach a remote location and press the tool into operating engagement with the surface to be finished in a convenient manner. The tool **10** generally comprises a tubular buffer attachment **14** which surrounds an elongated frame generally indicated at **16** having a tubular handle **18** through which extends a line cord **20** for driving means generally indicated at **21** having an electric motor **22** for driving axially a tubular housing **23** which is surrounded by and carries the attachment **14,** whereby the motor **22** drives the attachment **14** to cause it to rotate about its axis for buffing or polishing a surface. A washer **24** secures the attachment **14** in place by means of a wing nut **25** threaded onto a driven shaft **26** and tightened against the washer **24,** the driven shaft **26** being driven via an output shaft **27** of the motor **22** via reduction gears generally indicated at **29.** A set of screws, such as the screw **30,** fastens the rear end of the attachment **14** to the frame **16.** The opposite end (not shown) of the electrical cord **20** is adapted to be connected electrically to a source of alternating current for powering the motor **22,** it being understood that a switch (not shown) may be provided in series with the line cord **20** and that the motor may

be a DC motor and the cord **20** adapted to be plugged into a cigarette lighter of an automobile for being energized by a battery of the automobile.

As shown in FIGS. **9** through **12**, the tool **10** may be used for other purposes. As shown in FIG. **9**, an abrasive attachment **31** may be used in place of the buffer attachment **14**, the attachment **31** generally comprising a tubular frame **31A** being covered with emery cloth fabric material **31B**. The tool **10** may also be used for drilling purposes as shown in FIG. **10**, and in this regard, a chuck **32** may be provided and threaded onto the end portion of the driven shaft **26** for holding a drill bit **34**, the washer **24** and the wing nut **25** not being needed for this application. When used for drilling purposes as shown in FIG. **10**, the motor **22** drives the shaft **26** via the reduction gears **29**, and the tool **10** is held in one hand by the handle **18** to support the tool in an operating position, it being understood that there is no need for shifting any gears or otherwise prepare the tool **10** for utilizing any of the auxiliary tools shown in FIGS. **9** through **12** or other tools which may be attached to the driven shaft **26**. As shown in FIG. **11**, a honing tool **36** may be attached to the driven shaft **26** by means of the chuck **32**, and as shown in FIG. **12**, a grinding wheel **38** may be attached directly to the driven shaft **26** against the housing **23** by means of the wing nut **25** tightened on the shaft **26** against the washer **24** disposed between the wheel **38** and the nut **25**, it being understood that the housing **23** rotates with the shaft **26** at the same speed and thus it is possible to attach a tool in the manner as shown in FIG. **12**. Other types and kinds of auxiliary tools may be employed as will become apparent to those skilled in the art in accordance with the present invention.

Considering now the tool **10** in greater detail with reference to FIGS. **2** through **8** of the drawings, the frame **16** includes a rear end block **42** integrally connected to the handle **18**, a front block **44** for supporting the electrical motor **22** between the blocks **42** and **44** by means of stud bolts, such as the bolt **46** extending through a hole **48** and an aligned hole **50** in the laminated armature piece **52** and threaded into an internally threaded hole **54** of the rear end block **42**, a nut **56** being threaded onto a front threaded end portion **58** of the bolt **46** and being tightened against the front block **44** of the frame **16**. A centrally-apertured cylindrical cup-shaped member **61** loosely receives and surrounds the rear end portion of the driven shaft **26** and is fastened to the front block **44** by a plurality of screws, such as the screw **63**. A larger diameter cylindrical cup-shaped member **65** has a rearwardly opening rim **67** and is rotatably mounted about a forwardly-extending hub or boss **69** of the member **61** by means of a bearing **71**. A central hole **73** of the member **65** receives loosely the shaft **26**. A key **75** on the member **65** fits in a keyway slot **77** in the shaft **26** to enable the shaft **26** to drive the member **65**, and a washer **79** is held in place by a radially-extending set screw **82** to prevent axial movement of the member **65** relative to the shaft **26**. A threaded end portion **85** of the shaft **26** extends axially forwardly beyond the member **65** to drive the auxiliary tools as shown in FIGS. **10**, **11** and **12**.

Considering now the driving means **21** in greater detail, the line cord **20** includes a pair of conductors **86** and **88**, which extend through holes, such as the hole **91** in the rear end block **42**, for powering the motor **22**. The motor **22** includes a rotor **93** having the forwardly-extending output shaft **27** journaled for rotation by a wick-type self-aligning bearing **95** mounted within a central opening **97** of the block **44**. A similar wick-type self-aligning bearing **99** is mounted within a central opening **100** of the rear end block **42** for journaling for rotation a rearwardly-extending shaft **101** from the rotor **93**. The block **42** includes a rearwardly-extending boss **103** integrally connecting the handle **18** and the main portion of the block **42** for carrying a bearing **105** for rotatably supporting a centrally-apertured end plate **107**, the screws, such as the screw **30** being threaded into the end face of the plate **107** and a plurality of screws, such as the screw **109** fastening the housing **23** to the end plate **107** to rotatably support the housing on the frame **16**. A plurality of screws, such as the screw **110**, near the front end portion of the tubular housing **23** to the larger diameter member **23**, both the screws **109** and **110** being fastened into counter-sunk holes.

The armature **52** includes a winding **112** which is wound in a conventional manner. For powering the motor, a pair of brushes **114** and **116** engage the segments **118** in a conventional manner, and a pair of conductors **86** and **88** of the electrical line cord **20** extending through the handle **18** are electrically connected respectively to the pair of conductive sleeves **120** and **122** having bores, such as the bore **124** in the sleeve **120** for receiving slidably the brush **114** urged by a spring **128** into engagement with the segments **118** and seated against an adjustment screw **131** threaded into the outer end of the sleeve **120**. A pair of insulating sleeves **133** and **135** surround the respective inner conductive sleeves **120** and **122** to insulate them from the oppositely-disposed bosses **137** and **139** of the rear end block **42**. The reduction gears **29** include a pinion **142** integrally formed on the distal end portion of the output shaft **26** meshing with a larger gear **144** for reduction purposes. A jackshaft **146** journaled for rotation at its opposite ends between the front block **44** and the cup-shaped member **61** supports and is fixed to the gear **144** and an idler gear **148** which meshes with another idler gear **151** fixed to the rear end of the shaft **26**.

Considering now the attachment **14** in greater detail with particular reference to FIG. **2** of the drawings, the attachment **44** includes a porous tube **153** composed of a somewhat stiff fabric material with a fuzzy tufted outer surface **154** to be used for buffing purposes. At the opposite ends of the tube **153** inwardly bent end portions **155** and **157** are clamped by the washer **24** and fastened with the screws, such as the screw **30**.

Referring now to FIGS. **2** and **4** of the drawings, in accordance with the present invention a fan blade **159** is fixed by means of a screw **162** to the shaft **27** between the rotor **93** and the bearing **95** to move air radially outwardly to a plurality of holes, such as the hole **164** having an inwardly struck baffle or tab **166**, in the housing **23** for guiding air through the porous tube **153** for blowing away any residue which may form during a buffing operation. The holes, such as the hole **164** may be square or rectangular in shape, or it may be semi-circular in shape. A plenum chamber or space **168** is provided between the driving means **21** and the housing **23** to receive the air from the fan blade **159** and distribute it to the holes in the housing **23**. A guide member **170** composed of metal material serves to fa-

cilitate the directing of air radially outward to the plenum chamber **168.** The guide **170** is generally annular in shape having a pair of U-shaped rearwardly extending portions **170A** and **170B** for receiving leg portions **44A** and **44B** respectively of the front block **44.** The U-shaped portions include a pair of holes, such as the hole **170C**, for receiving the pair of stud bolts, such as the stud bolt **46.** A pair of C-shaped rearwardly-extending flanges **170D** and **170E** antegrally connected to the guide **170** facilitate the directing of the air in a radially outwardly movement. The motor **22,** the fan blade **159** and the guide **170** may be purchased from Lexel Industries, Inc. of Hutsonville, Illinois.

In order to draw air into the interior of the housing **23** for cooling the motor **22** by means of the fan blade **159,** a plurality of inwardly canted holes, such as the holes **172** and **174,** in the end plate **107** guide air into the interior of the housing **23** and into a plurality of holes, such as the holes **176** and **178** inclined toward the axis of the tool **10,** whereby the air is drawn over the motor **22** for cooling purposes and then to the fan blade **159** for moving it radially outwardly to the plenum chamber **168** to be distributed to the holes in the housing **23.**

It will be readily apparent to those skilled in the art that the present invention provides a novel and useful improvement in multipurpose hand tools of the character described herein. The arrangement and types of structural components utilized within the invention may be subject to numerous modifications well within the purview of this invention and it is intended only to be limited to a liberal interpretation of the specification and appended claims.

What is claimed is:

1. A tool adapted to finish a surface and adapted to be used alternatively for driving an auxiliary tool means, comprising:

a single elongated rearwardly-extending handle adapted to be grasped by a hand of the user to support completely the tool and having front and rear end portions;

frame means fixed to and axially-aligned with said front end portion of said handle;

a tubular housing surrounding and axially aligned with said frame, said housing having tool means on the outer surface thereof for finishing the surface;

means for mounting rotatably said housing on said frame means to rotate axially relative thereto;

driving means mounted on said frame means substantially within said tubular housing for rotating axially said housing relative to said frame means, said driving means having a forwardly-extending output shaft;

means for connecting drivingly an intermediate portion of said output shaft to said housing means; and

a free distal end portion of said shaft extending forwardly for receiving directly and for driving directly the auxiliary tool means.

2. A tool according to claim **1,** further including attaching means disposed forwardly of and beyond said frame means for connecting said distal end portion and the auxiliary tool means.

3. A tool according to claim **2,** further including means defining a plurality of radial openings extending through said tubular housing and said tool means, fan means drivingly coupled to said output shaft for blowing air radially outwardly through said openings, said means thereon for finishing being porous to permit the air to pass therethrough.

4. A tool according to claim **3,** further including a closure member at the rear end portion of said housing, said closure member having means defining a plurality of holes extending therethrough to permit air to be drawn through said holes past and into contact with said driving means for cooling it and from said driving means out said openings.

5. A tool according to claim **4,** further including means for mounting said drive means within said housing intermediate said ends in the path of travel of air moving forwardly from said holes.

6. A tool according to claim **4,** further including guiding means fixed to said frame means for directing air from said driving means radially outwardly to said openings.

7. A tool according to claim **6,** wherein said handle is tubular in shape and has an axial opening extending throughout the length of said handle, said driving means including an electric motor having a power supply cord extending therefrom through said handle, further including reduction gears interposed between said output shaft and said housing and said attaching means disposed outside of said tubular housing.

8. A tool according to claim **3,** further including guiding means fixed to said frame means for directing air from said driving means radially outwardly to said openings.

9. A tool according to claim **3,** further including a plurality of unidirection scooping means for enabling air to enter said openings from said fan means.

10. A tool according to claim **9,** wherein said scooping means includes a plurality of inwardly-extending struck-out tab portions.

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