

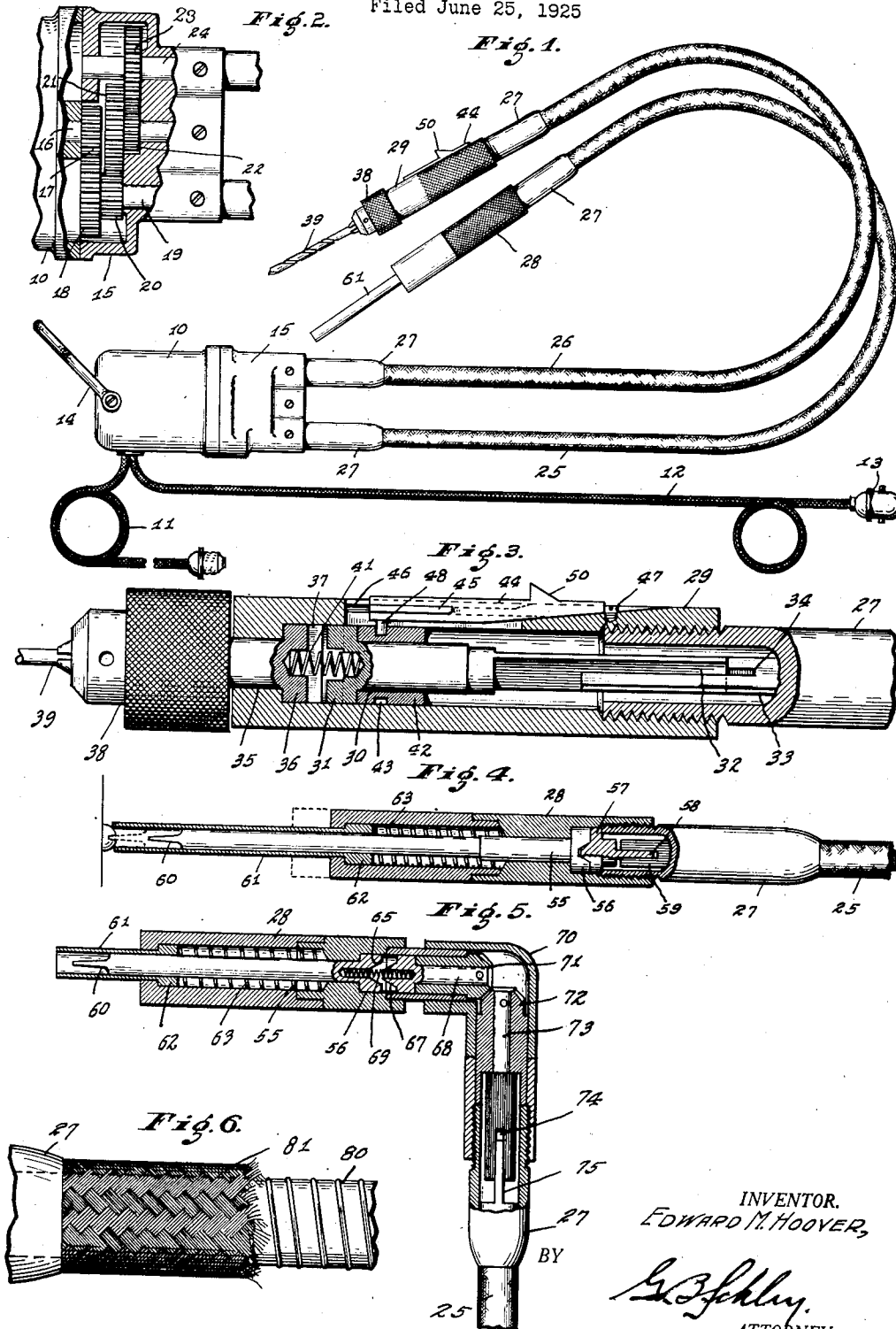
Jan. 15, 1929.

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1,698,952

MOTOR TOOL

Filed June 25, 1925



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MOTOR TOOL.

Application filed June 25, 1925. Serial No. 39,627.

It is the object of my invention to produce a power-driven-motor tool capable of many uses, such as driving screws, setting nuts, drilling or reaming holes, boring, and grinding. More specifically it is the object of my invention to drive two or more tools from a common driving means such as an electric, water, or air motor, each of the tools being connected to the motor by flexible shafts, and at least one of the driven tools being disengageable from its associated driving shaft. A further object of my invention is to produce a casing or sheath for each flexible driving shaft, which sheath will not twist or whip under the reaction to which it is subjected when the shaft within it is running.

I accomplish the above objects by providing a gear train driven from a motor and adapted to drive two flexible shafts to the ends of which are affixed any desired rotatable tools, and between at least one of such tools and its associated driving shaft I provide a clutch which may be engaged to form a driving connection between the shaft and its associated tool. Such engagement may be caused by pressure of the tool on the work or by the operation of a clutch controlled by the operator. To prevent the flexible shaft sheath from twisting, I provide the customary casing with an outer covering formed of woven wires, which wires follow generally helical paths from one end of the casing to the other, some of such wire paths being right-hand helices and the others left-hand helices.

The accompanying drawing illustrates my invention: Fig. 1 is a view showing a complete motor tool; Fig. 2 is a fragmental section through the motor casing showing the gear train by which the two flexible shafts are driven from the motor; Fig. 3 is a sectional view through one of the tool-handles showing details of the clutch by which the tool is connected to its flexible shaft; Fig. 4 is a sectional view through the handle of the other tool, in this case a screw driver, showing details of structure; Fig. 5 is a central view showing a modification of the device illustrated in Fig. 4; and Fig. 6 is a plan view on an enlarged scale showing details of the woven-wire covering surrounding the flexible shaft casing.

My device comprises a motor casing 10 within which is mounted any suitable power motor (not shown), the supply wires 11 for the electric motor passing through the side

of the casing 10. Wires, 12, also passing through the wall of the casing 10, form connections for a switch 13 by which the motor is controlled. Preferably, the casing 10 is provided with a handle 14 which may be used in transporting the tool or in hanging it from any suitable support.

Mounted on the end of the casing 10 is a housing 15 in which is the gear train by which the flexible shafts are driven from the motor. The motor shaft 16 extends into the housing 15 and is provided with a gear 17 mating with a gear 18 which is attached to a shaft 19. The shaft 19 is provided with a gear 20 which drives, preferably through two idler gears 21 and 22, a gear 23 which is rigid with a shaft 24 mounted in the housing 15. If it is desired to have the two shafts 19 and 24 operate at the same speed, the gear 22 may be eliminated and the gear 23 be arranged to mesh directly with the gear 21. Other arrangements of a gearing are possible to drive the shafts 19 and 24 as may be desired.

The two shafts 19 and 24 are connected respectively to a flexible shaft encased in sheaths 25 and 26. The ends of each sheath 25 and 26 are provided with fittings 27, a fitting 27 on one end of each shaft being attached to the housing 15. Attached to the fittings 27 on the opposite ends of the sheaths 25 and 26 are handles 28 and 29 by which the driven tools are supported.

The handle 29 is provided with a central bore in which is a rotatable shaft 30 provided at one end with a central transverse tongue 31 and at the other end with a longitudinally extending tongue 32. The flexible shaft in the sheath 26 terminates in a member 33 which is provided with a longitudinal slot 34 for the reception of the tongue 32. This method of connecting the shaft 30 with the flexible shaft in the sheath 26 forms a positive driving connection between these two shafts while permitting longitudinal movement of the shaft 30 in the handle 29. Also rotatably mounted in the handle 29 is a shaft 35 which has an enlarged head 36 provided with a groove 37 adapted to receive the transverse tongue 31 on the shaft 30. To the outer end of the shaft 35 is affixed any desired tool. I have shown the shaft 35 as equipped with a chuck 38 which holds a drill 39.

A coil spring 41 acting between the shafts 30 and 35 tends to separate such shafts and hold them out of operative engagement. The

intermediate part of the shaft 30 is reduced in diameter and is surrounded by a collar 42 provided with an annular groove 43. Slidably mounted in the handle 29 is a clutch-operating member 44. This clutch-operating member is located in a slot in the wall of the handle 29, being retained in such slot by means of tongues 45 which engage grooves 46 cut in the side walls of the slot. A screw 47 inserted in the handle 29 after the clutch-operating member 44 is in place limits the rearward movement of such member. On the inner face of the member 44 is a pin 48 which enters the groove 43. The outer face of the member 44 may be provided with a projection 50 to aid in operating the clutch. It will be evident that movement of the clutch-operating member 44 to the left (Fig. 3) will compress the spring 41 and cause the groove 37 to enter the tongue thus forming a driving connection between the shafts 30 and 35.

The handle 28 rotatably supports a shaft 55, the enlarged head 56 of which is connected by a tongue and groove connection to a rotating member 57 provided with a plate 58. The end of the flexible shaft in the sheath 25 terminates in a slotted plate 59 similar to the plate 33 above described. The plate 58 is received within the slot in the plate 59. The outer end of the shaft 55 terminates in a screw driver point 60.

The outer portion of the shaft 55, including the screw driver point 60, is surrounded by a tube 61 which enters the handle 28 and is provided within such handle with an enlarged head 62 between which and a shoulder in the bore of the handle 28 there operates a coiled compression spring 63 which normally forces the tube 61 outward so that the screw driver point 60 is within the tube. When it is desired to drive a screw, the end of the tube 61 is placed against the end of the screw and forms a support for it and a guide for the screw-driver. When the operator, holding the tool by the handle 28, applies pressure to the screw the spring 63 is compressed until the screw driver point 60 enters the slot in the screw, the screw being driven by rotation of the shaft 55.

In Fig. 5 is illustrated a modification in which the screw driver is provided with a 90° drive from its associated shaft and is also provided with a clutch which is normally out of engagement when the screw driver is not operated but which is automatically engaged by pressure upon the screw driver point.

In the device shown in Fig. 5, the handle 28 supports the shaft 55 with its surrounding tube 61 as in the device illustrated in Fig. 4. The coil spring 63 operates against the head 62 of the tube 61 to normally hold such tube outward far enough to encase the screw driver point 60. The enlarged head 56 of the shaft 55 is provided with a transverse slot

65 within which may be received a tongue 67 integral with a shaft 68. A coil spring 69, acting between the shaft 68 and the shaft 55, normally holds the tongue 67 out of engagement with the groove 65, so that the shaft 55 is not rotated. A gear casing 70 attached in any suitable manner to the handle 28 encloses miter gears 71 and 72, the gear 71 being affixed to the shaft 68. The gear 72 is affixed to one end of the shaft 73, the opposite end of which is provided with a longitudinal slot 74 for the reception of a tongue 75 on the end of the flexible shaft within the sheath 25.

The operation of the device illustrated in Fig. 5 is somewhat similar to that of the screw driver shown in Fig. 4. The operator, holding the device by the handle 28, applies the end of the tube 61 to the screw head and forces the tube 61 within the handle 28 until the screw driver point 60 comes in contact with the screw head. Continuation of the pressure against the screw head causes compression of the spring 69 with the result that the tongue 67 enters the groove 65 and forms a driving connection between the shafts 68 and 65. When the screw is driven, the operator removes the screw driver point from the slot in the head of the screw, and the spring 68 forces apart the shafts 55 and 68, this breaking the driving connection between them.

Flexible shafts are commonly provided with casings 80 similar to that shown in Fig. 6 in which a single continuous flat metal strip is helically wound to form a tube. The reaction to which this tube is subjected when the shaft within it rotates causes the tube to twist and whip about. To eliminate this, I surround the casing 80 with a jacket 81 formed of woven wires. These wires are arranged in two groups, the wires of one group extending helically about the casing 80 in a right-hand helix and the other wires extending in a left-hand helix. At each end of the casing 80, the jacket 81 is securely attached to the fitting 27. This jacket prevents the objectionable twisting and whipping to which an unenclosed flexible-shaft casing is subjected.

I claim as my invention:—

1. A motor tool, comprising a portable motor, two flexible shafts connected to said motor and arranged to be driven therefrom, a flexible casing surrounding each of said shafts and terminating in a handle adapted to be grasped and directed by the hand of an operator, said casing being sufficiently rigid to prevent whipping of its associated shaft when left free, and a pair of tools adapted for independent use, said tools being respectively mounted in said handles and arranged to be driven from the associated shafts.

2. A power-driven tool, comprising a hollow handle, a rotatable member mounted in

5 said handle and adapted to receive a tool, a power-driven shaft mounted in said handle co-axial with said rotatable member, said rotatable member and said shaft having opposed faces provided with clutching means, and a hand-operated clutch-operating member longitudinally slidable in said handle and arranged to control the engagement of the clutching faces of said shaft and said
10 rotatable member.

3. The combination set forth in claim 2 with the addition of a spring tending to hold the clutching faces of said rotatable member and said shaft out of engagement.

15 4. A power-driven tool, comprising a hollow handle, a rotatable member mounted in said handle and adapted to receive a tool, a power-driven shaft rotatably and slidably mounted in said handle co-axial with said rotatable member, said rotatable member and
20 said shaft having opposed faces provided with clutching means, and a hand-operated clutch-operating member longitudinally slidable in said handle and arranged to move

said shaft longitudinally of said handle to 25 control the engagement of the clutching faces of said shaft and said rotatable member.

5. The combination set forth in claim 4 with the addition of a spring tending to hold the clutching faces of said rotatable member 30 and said shaft out of engagement.

6. A motor tool as set forth in claim 1, with the addition that each of said casings comprises an inner flexible sleeve and a woven wire covering surrounding said sleeve, said 35 covering consisting of two groups of wires, each of such groups being composed of a multiplicity of wires with the wires of one group interwoven with those of the other groups, one group of wires extending along 40 said sleeve in right-hand helices and the wires of the other group extending along said sleeve in left-hand helices.

In witness whereof, I have hereunto set my hand at Indianapolis, Indiana, this 23rd 45 day of June, A. D. one thousand nine hundred and twenty-five.

EDWARD M. HOOVER.