

ATTORNEY

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H. EMMERICH

3,521,434

LAWN MOWER

Filed Oct. 4, 1967

4 Sheets-Sheet 2

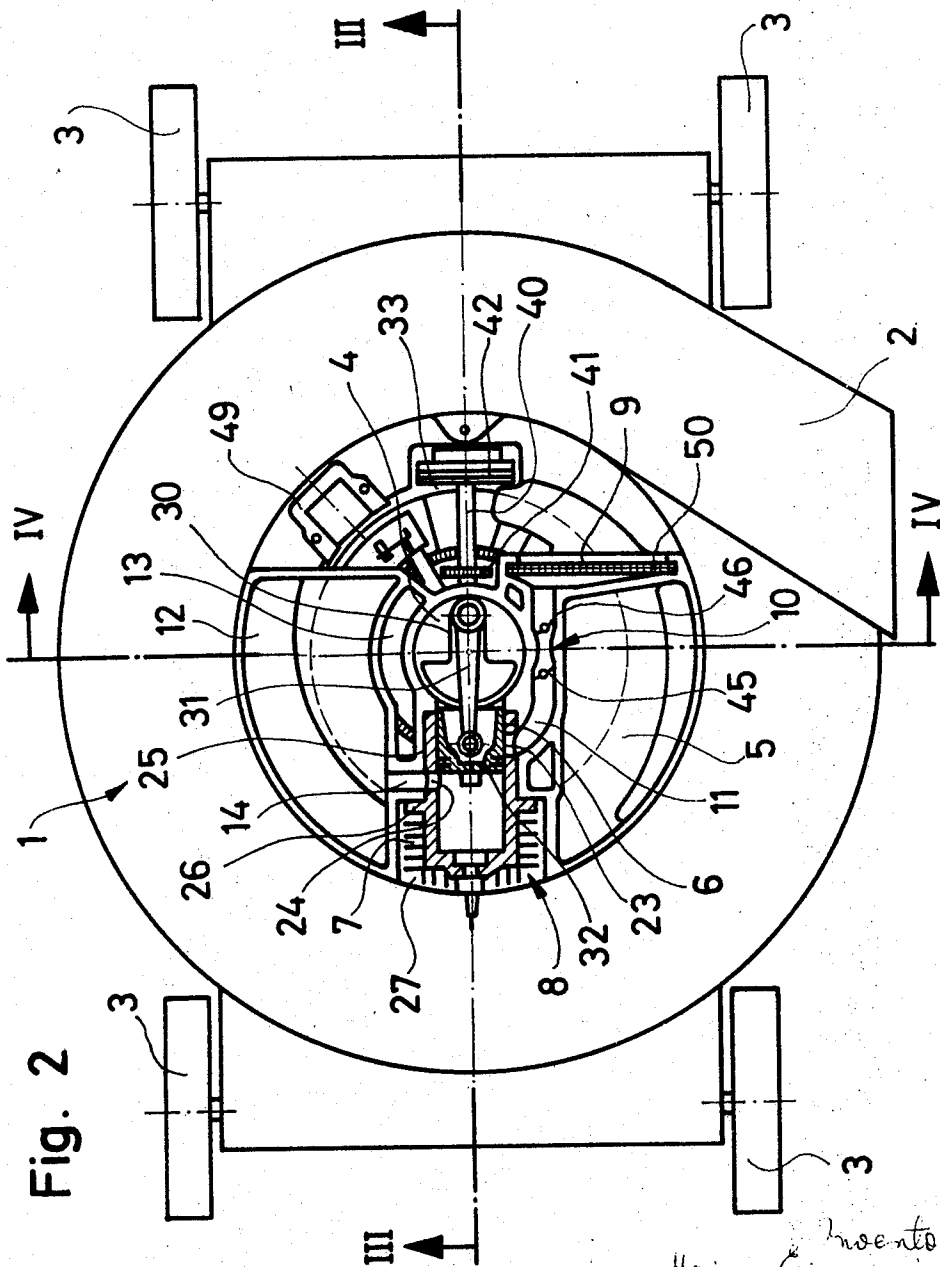


Fig. 2

Inventor:
Heinz Emmerich
By Michael S. Stricker
Attorney

July 21, 1970

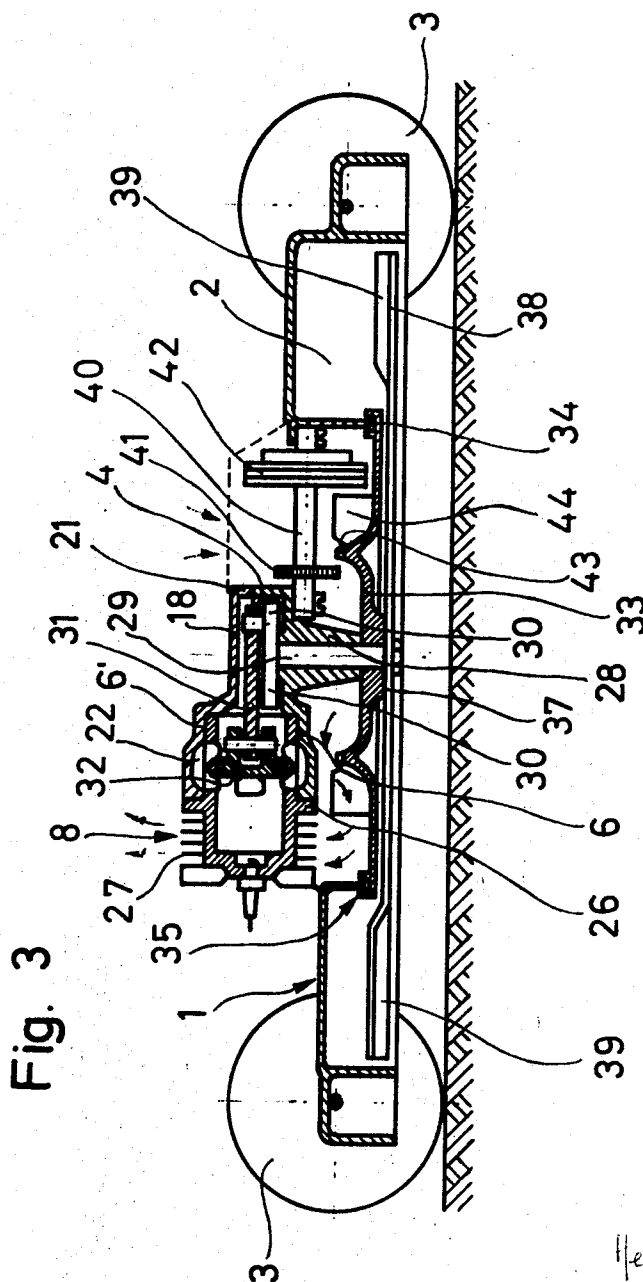
H. EMMERICH

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Inventor:
Heinz Emmerich
By Michael S. Striker,
Attorney

July 21, 1970

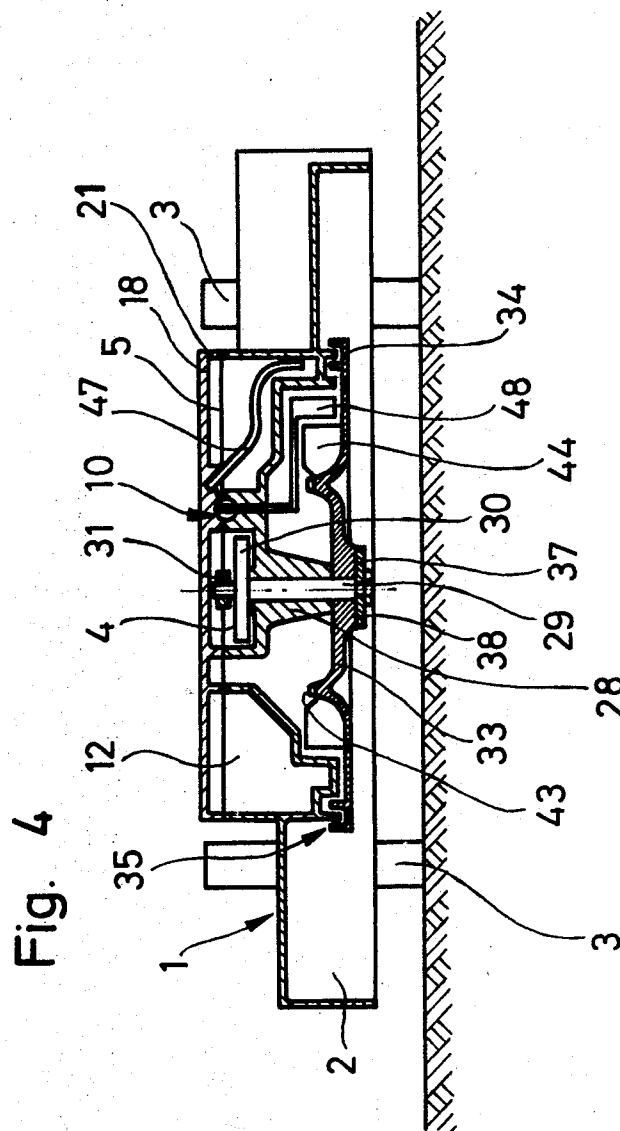
H. EMMERICH

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Inventor:
Henry Ammerich
By Michael S. Striker
Attorney

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3,521,434

LAWNMOWER

Heinz Emmerich, Boblingen, Wurttemberg, Germany, assignor to Solo Kleinmotoren GmbH, Maichingen, Wurttemberg, Germany

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17 Claims

ABSTRACT OF THE DISCLOSURE

A lawnmower whose housing consists of cast aluminum or magnesium alloy. The crank case, exhaust duct, fuel tank, carburetor, filter space and passages for cooling air, fuel and combustion products are integral with or are defined by a one-piece casting which constitutes the housing and is mounted on wheels. The cylinder of the two-stroke cycle engine is inserted into the housing in horizontal position and drives a vertical crankshaft which carries a blade and an impeller wheel serving to circulate cooling air, to support a magnet of the ignition system, and to transmit motion to the crankshaft during starting. A grass evacuating duct surrounds the engine, and the impeller wheel seals the underside of the housing. The upper side of the housing is closed by a detachable plate-like cover.

BACKGROUND OF THE INVENTION

The present invention relates to lawnmowers of the type wherein the blade rotates about a vertical axis. More particularly, the invention relates to improvements in power-operated lawnmowers.

It is already known to make the housing of a lawnmower of an aluminum or magnesium alloy. Such housings are preferred over housings consisting of drawn sheet steel stock because they are more resistant to corrosion, less likely to produce excessive noise, lighter and of eye-pleasing appearance. However, presently known light metal housings are quite expensive and their manufacture necessitates the use of a large number of dies.

SUMMARY OF THE INVENTION

It is an object of my invention to provide a simple, compact and inexpensive housing or chassis for a power-operated lawnmower.

Another object of the invention is to provide a lawnmower which comprises fewer parts than a conventional lawnmower and which can be assembled, dismantled, cleaned, inspected and/or repaired with little loss in time.

A further object of the invention is to provide an improved housing for a lawnmower of the type wherein the blade rotates about a vertical axis and is driven by an internal combustion engine.

An additional object of the invention is to provide a lawnmower wherein several components of the internal combustion engine form an integral part of the housing.

A concomitant object of the invention is to provide a lawnmower wherein the fuel tank and the crankcase form integral parts of the housing.

Briefly outlined, my invention is embodied in a lawnmower comprising a wheel-mounted housing consisting of a one-piece metallic casting, rotary blade means, and an air-cooled internal combustion engine having a rotary output member connected with the blade means. The engine further comprises a plurality of components which constitute integral parts of and/or recesses, channels, ducts, passages or like cavities provided in the one-piece housing. Such components include a fuel tank, an exhaust duct for combustion products, a compartment for a portion

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of a removable cylinder which drives the output member, a crank case for the output member, a carburetor, and a casing which defines a path for the flow of cooling air to the cylinder and around other heat-sensitive components.

The output member further carries an impeller wheel which circulates air and is in sealing engagement with the underside of the housing just above the blade means. A flat plate-like cover is detachably secured to the upper side of the housing and overlies the fuel tank, crank case, exhaust duct and one or more further components of the engine.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved lawnmower itself, however, both as to its construction and its mode of operation, together with additional features and advantages thereof, will be best understood upon perusal of the following detailed description of a specific embodiment with reference to the accompanying drawing.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is an exploded perspective view of a lawnmower which embodies my invention;

FIG. 2 is a top plan view of the lawnmower with the cover removed and with the cylinder shown in section;

FIG. 3 is a longitudinal vertical section as seen in the direction of arrows from the line III—III of FIG. 2; and

FIG. 4 is a transverse vertical section as seen in the direction of arrows from the line IV—IV of FIG. 2.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The improved lawnmower comprises a housing 1 provided with an arcuate grass evacuating channel 2 and mounted on four wheels 3. The channel 2 surrounds a substantially circular central part of the housing 1 (see particularly FIG. 2) which accommodates a two-stroke cycle internal combustion engine. Several components of the engine are integral with the central part of the housing 1 and include a crank case 4, a fuel tank 5, a cylinder compartment 6 and an air circulating compartment 7. The cylinder is shown at 8 and the space for the air cleaner or filter 50 is denoted by the numeral 9.

The housing 1 is provided with a depression or groove which extends between the crank case 4 and fuel tank 5. This groove has a first part 10 which is the carburetor and a second part 11 which is the feed duct for admission of a combustible mixture into the cylinder 8. The fuel tank 5 is located opposite an exhaust duct 12 which is separated from the crank case 4 by a heat-insulating air gap 13. The cylinder compartment 6 is connected with the exhaust duct 12 by a passage 14.

In the region below the fuel tank 5, the housing 1 defines a helical casing 15 for the engine cooler. This casing 15 communicates with the air circulating compartment 7. The housing 1 further comprises mounting means 16, 17 for an ignition coil or interrupter. All of the heretofore described components 2, 4-7 and 9-17 form integral parts of or are defined by the housing 1. This housing is a one-piece casting which preferably consists of a lightweight and corrosion-resistant aluminum or magnesium alloy.

The housing 1 supports a detachable cover or shroud 18 which is substantially flat and has an opening 19 for admission of fuel into the tank 5. The cover 18 is further provided with slits 20 located above the gap 13 to admit fresh air. Still further, the cover 18 has a recess 9' which forms an extension of the space 9 for the filter 50 and a recess 6' which forms an extension of the cylinder compartment 6. Portions or webs 21 of the

cover 18 are in sealing engagement with the adjoining portion of the housing 1. An overflow channel 22 is provided above the recess 6'.

The cylinder 8 is inserted into the air circulating compartment 7 and it also extends into the compartment 6 and extension 6'. This cylinder comprises a smooth-surfaced cylindrical portion 25 which fits into the composite compartment 6, 6'. The cylindrical portion 25 has fuel admitting ports 23 in communication with the feed duct 11 and exhaust ports 24 in communication with the passage 14. A flange 26 of the cylinder 8 is bolted to the housing 1. The cooling fins 27 of the cylinder 8 are accommodated in the air circulating compartment 7. The upper side of the compartment 7 is open.

The housing 1 is further provided with a vertical bearing sleeve 28 which extends downwardly from the crank case 4 and accommodates a portion of a crankshaft 29 which constitutes the output member of the engine. The upper end of the crankshaft 29 extends into the crank case 4 and carries a crank arm 30 coupled to the piston 32 of cylinder 8 by a piston rod 31. The lower end of the crankshaft 29 carries a bladed impeller wheel 33 which is surrounded by the channel 2 and closes the median portion of the underside of the housing 1. The marginal portion 34 of the impeller wheel 33 forms with the housing 1 a labyrinth seal 35 which is shown in FIG. 4 and serves to prevent entry of grass into the path wherein cooling air circulates when the impeller wheel is driven by the crankshaft 29. The magnet 36 of the igniter assembly is cast into the body of the impeller wheel 33 (see FIG. 1). The underside 37 of the impeller wheel 33 is adjacent to a blade 38 which is affixed to the crankshaft 29 and is provided with cutters 39. The cutters 39 sever grass when the engine is running and such grass is expelled through the channel 2.

The housing 1 also supports the shaft 40 of a starter assembly, and this shaft carries a gear 41 and a pulley 42 which can be rotated by a customary rope (not shown). The starter is of the reversible type, i.e., by pulling the rope the operator causes the gear 41 to move into mesh with and to rotate a ring gear 43 on the impeller wheel 33 whereby the wheel 33 rotates the crankshaft 29 to start the engine. The vanes 44 of the wheel 33 suck air through the filter 50 at the upper side of the housing 1 and such air flows through the casing 15 below the cylinder 8 and into the air circulating compartment 7 where it cools the fins 27. Hot air is discharged upwardly at the open upper side of the compartment 7.

The carburetor 10 accommodates a throttle valve 45 and an air flow regulating valve 46. These valves are installed prior to attachment of cover 18 to the housing 1. A suction pipe 47 extends from the carburetor 10 into the bottom portion of the fuel tank 5. An automatic fuel supply regulator 48 extends into the path of air circulated by the vanes 44 to control the delivery of fuel as a function of the engine speed.

FIG. 2 further shows an ignition coil 49 which is secured to the mounting means 16, 17 of the housing 1. The air cleaner or filter 50 is inserted into the space 9 and also extends into the recess 9' when the cover 18 is attached to the housing. This filter is always accessible from above and its plane is preferably parallel to the axis of the crankshaft 29.

An important advantage of the just described construction is that the lawnmower can be produced at a surprisingly low cost without affecting the quality. The lawnmower is of compact and lightweight design and its height is very low so that it can be readily pushed below bushes, lowermost branches of trees and into other hard-to-reach areas. Furthermore, and since the overall weight of the lawnmower is low, it can be readily handled in mowing of grass on steeply inclined grounds. Such low weight also insures that the wheels 3 leave minimal traces in the lawn and renders it possible to entrust the operation of the

lawnmower to women and adolescents because its manipulation requires a small effort. The assembly or dismantling consumes little time because the lawnmower comprises a small number of parts. This facilitates repair and periodic inspection or cleaning.

The fact that the cylinder 8 is installed in horizontal position contributes to compactness and low weight of the lawnmower. Such compactness is further due to placing of the cylinder 8 between the fuel tank 5 and the exhaust duct 12, and to the fact that the cylinder 8, crank case 4, tank 5 and exhaust duct 12 occupy a circular space which is surrounded by the evacuating channel 2. The carburetor 10 is located directly opposite the exhaust duct 12. In order to insure that little heat is transmitted from the exhaust duct 12 to the crank case 4 and other heat-sensitive parts, the housing 1 is provided with the aforementioned heat-insulating gap or gaps 13 and the impeller wheel 33 circulates coolant in areas which are likely to be overheated by exchange of heat with the duct 12. Also, the cross section of such portions of housing 1 which connect the exhaust duct 12 with adjoining parts are held to a minimum. The fuel tank 5 is located directly below the feed duct 11 so that fuel can be drawn into this duct by flowing in a very short path.

Additional savings in space and cost are achieved by employing the impeller wheel 33 as a means for closing and sealing the central portion of the housing from below and by employing the impeller wheel as a means for transmitting motion to the piston 32 during starting and as a carrier for the magnet 36. The marginal portion 34 of the impeller wheel 33 is shaped during casting of this wheel and the same applies for the adjoining portion of the housing 1 so that the formation of a satisfactory seal 35 requires no separate treatment of parts 1 and 33. The blade 38 can be affixed to the crankshaft 29 and/or to the impeller wheel 33.

The filter 50 is accessible from the exposed upper side of the cover 18 and can be inspected or replaced at any time. Also, and since the parts 23, 24 are provided in the housing 1, the assembly of my lawnmower merely requires insertion of valves 45, 46, of a nozzle, of wheels 3, of cylinder 8, crankshaft 29, wheel 33, blade 38, starter assembly, ignition coil 50 and the fastening of cover 18. Many of those parts of the housing 1 which constitute components of the engine are substantially normal to the general plane of the housing.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt it for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of my contribution to the art and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the claims.

What is claimed as new and desired to be protected by Letters Patent is set forth in the appended claims.

I claim:

1. A lawnmower comprising a wheel mounted housing consisting of a one-piece metallic casing; rotary blade means; and an internal combustion engine comprising substantially horizontal cylinder means, a rotary output member connected with said blade means and a plurality of components constituting integral parts of said one-piece housing and including a crank case for said output member, carburetor means, a fuel tank, and an exhaust duct for combustion products, said cylinder means being removably located in a compartment provided in said housing intermediate said exhaust duct and said fuel tank.

2. A lawnmower as defined in claim 1, wherein said cylinder means is located intermediate said fuel tank and said exhaust duct, said cylinder means, exhaust duct, fuel tank and crank case occupy a substantially circular central portion of said housing.

3. A lawnmower comprising a wheel-mounted housing

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consisting of a one-piece metallic casting; rotary blade means; an internal combustion engine having cylinder means, a rotary output member connected to said blade means and a plurality of components including a crank case for said output member, carburetor means, a fuel tank, an exhaust duct for combustion products, and a compartment housing said cylinder means, said components constituting integral parts of said one-piece housing and having upper open ends; and a single substantially flat cover releasably connected to said housing and closing said open ends of said components.

4. A lawnmower as defined in claim 3, wherein said components further include a casing defining a path for cooling air into said compartment.

5. A lawnmower as defined in claim 4, further comprising a removable air cleaner, said components further including a portion defining an air-admitting space in communication with said path and accommodating said air cleaner.

6. A lawnmower as defined in claim 3, wherein said cylinder means removably extends into a composite compartment defined by said housing and said cover.

7. A lawnmower as defined in claim 6, wherein said cover resembles a plate having a recess forming part of said composite compartment and web means abutting against an adjoining portion of said housing.

8. A lawnmower as defined in claim 3, wherein said housing has an underside and said output member is rotatable about a substantially vertical axis, and further comprising an impeller wheel mounted on said output member adjacent to the underside of said housing.

9. A lawnmower as defined in claim 8, wherein said impeller wheel is connected to said output member directly above said blade means.

10. A lawnmower as defined in claim 8, wherein said output member is a crankshaft.

11. A lawnmower as defined in claim 8, wherein said impeller wheel has a marginal portion forming with said housing an annular labyrinth seal.

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12. A lawnmower as defined in claim 3, said cylinder means having a smooth-surfaced portion received in said compartment defined by said housing, said smooth-surfaced portion having exhaust port means in communication with said exhaust duct and fuel admitting port means in communication with a feed duct provided in said housing between said carburetor means and said compartment.

13. A lawnmower as defined in claim 12, wherein said housing has a passage connecting said exhaust port means with said exhaust duct.

14. A lawnmower as defined in claim 12, wherein said cylinder means comprises flange means detachably secured to said housing and cooling fins received in a second compartment provided in said housing adjacent to said first mentioned compartment.

15. A lawnmower as defined in claim 3, wherein said housing has heat-insulating gap means provided between said crank case and said exhaust duct.

16. A lawnmower as defined in claim 3, wherein said housing further defines a space which is accessible from above and further comprising filter means removably accommodated in said space.

17. A lawnmower as defined in claim 16, wherein said filter means is located in a plane which is parallel to the axis of said output member.

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ROBERT PESHOCK, Primary Examiner

J. A. OLIFF, Assistant Examiner