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FORM 1

SPRUSON & FERGUSON

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

LODGED AT SUB-OFFICE
6 OCT 1987
Sydney

APPLICATION FOR A STANDARD PATENT

Ryobi Ltd., incorporated in Japan, of No. 762, Mesaki-cho, Fuchu-shi, Hiroshima, JAPAN, hereby apply for the grant of a standard patent for an invention entitled:

Electric Lawn Mower

which is described in the accompanying complete specification.

Details of basic application(s):-

Basic Applic. No:	Country:	Application Date:
153921/86	JAPAN	6 October 1986

The address for service is:-

Spruson & Ferguson
Patent Attorneys
Level 33 St Martins Tower
31 Market Street
Sydney New South Wales Australia

DATED this SIXTH day of OCTOBER 1987

Ryobi Ltd.

By: M.J. Anderson

Registered Patent Attorney

TO: THE COMMISSIONER OF PATENTS
OUR REF: 37424
S&F CODE: 59080

FEE STAMP TO VALUE OF $130 ATTACHED
MAIL OFFICER

5845/2

Spruson & Ferguson

AUSTRALIA CONVENTION STANDARD & PETTY PATENT DECLARATION SFP4

COMMONWEALTH OF AUSTRALIA

THE PATENTS ACT 1952

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention Application made for a patent for an invention entitled:

Title of Invention

ELECTRIC LAWN MOWER

Full name(s) and address(es) of Declarant(s)

I/~~We~~ Hiroshi Kohmoto, Manager of Patent Department (Authorized Signing Officer) of Ryobi Ltd., No. 762, Mesaki-cho, Fuchu-shi, Hiroshima, Japan

~~of~~

do solemnly and sincerely declare as follows:-

Full name(s) of Applicant(s)

1. ~~I am/We are the applicant(s) for the patent~~

(or, In the case of an application by a body corporate)

1. I am/~~We are~~ authorised by

Ryobi Ltd.

the applicant(~~s~~) for the patent to make this declaration on its/~~their~~ behalf.

2. The basic application(~~s~~) as defined by Section 141 of the Act was/~~were~~ made

Basic Country(ies) in Japan

Priority Date(s) on October 6, 1986

Basic Applicant(s) by Ryobi Ltd.

3. ~~I am/We are the actual inventor(s) of the invention referred to in the basic application(s)~~

(or where a person other than the inventor is the applicant)

Full name(s) and address(es) of Inventor(s)

3. Kazuyuki Takahashi of c/o Sera Kogyo Kabushiki kaisha, No. 52, Oaza Hongo, Sera-cho, Sera-gun, Hiroshima, Japan

~~of~~

~~(respectively)~~

is/~~are~~ the actual inventor(~~s~~) of the invention and the facts upon which the applicant(~~s~~) is/~~are~~ entitled to make the application are as follows:

Set out how Applicant(s) derive title from actual inventor(s) e.g. The Applicant(s) is/are the assignee(s) of the invention from the inventor(s)

The applicant is the assignee of the invention from the inventor.

4. The basic application(~~s~~) referred to in paragraph 2 of this Declaration was/~~were~~ the first application(~~s~~) made in a Convention country in respect of the invention(~~s~~) the subject of the application.

Declared at Hiroshima, Japan this 28th day of September 1987

Hiroshi Kohmoto

Signature of Declarant(s)
Hiroshi Kohmoto
Manager of Patent Department
(Authorized Signing Officer)

To: The Commissioner of Patents

11/81

(12) PATENT ABRIDGMENT (11) Document No. AU-B-79390/87
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 599426

(54) Title
ELECTRIC LAWN MOWER

International Patent Classification(s)
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(30) Priority Data

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61-153921	06.10.86	JP JAPAN

(43) Publication Date : **14.04.88**

(44) Publication Date of Accepted Application : **19.07.90**

(71) Applicant(s)
RYOBI LTD.

(72) Inventor(s)
KAZUYUKI TAKAHASHI

(74) Attorney or Agent
SPRUSON & FERGUSON

(56) Prior Art Documents
AU 69426/81 A01D 35/26
AU 20373/83 A01D 35/26

(57) Claim

1. An electric lawn mower comprising a line head having flexible strip edges wound thereon;

a housing having an upper portion and a lower portion;

said housing formed so that it has a flared profile wherein an upper leading surface of the housing becomes gradually more flattened towards the front of said mower;

said line head being rotatably supported by a spindle rotatable about a vertical axis thereof;

an electric motor being provided in said housing, the axis of the output shaft of said motor being substantially horizontal;

said output shaft being coupled through a reduction gear mechanism to said spindle.

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S & F Ref: 37424

FORM 10

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE:

Class Int Class

Complete Specification Lodged:
Accepted:
Published:

Priority:

Related Art:

Name and Address of Applicant: Ryobi Ltd.
No. 762, Mesaki-cho
Fuchu-shi
Hiroshima
JAPAN

Address for Service: Spruson & Ferguson, Patent Attorneys
Level 33 St Martins Tower, 31 Market Street
Sydney, New South Wales, 2000, Australia

Complete Specification for the invention entitled:

Electric Lawn Mower

The following statement is a full description of this invention, including the best method of performing it known to me/us

5845/3

Electric Lawn Mower

This invention relates to an electric lawn mower with flexible strip edges of synthetic resin such as "Nylon".

Description of the Prior Art

As shown in Fig. 4 of the accompanying drawings in a conventional electric lawn mower its electric motor a is vertical with respect to the ground b, and the motor shaft a' is coupled directly to the line head d on which flexible strip edges c are wound; a housing e is positioned above a cutting section consisting of the edges c.

Problems To Be Solved by the Invention

The conventional electric lawn mower thus constructed suffers from the following difficulties: As shown in Fig. 5, in the case where it is required to cut grass under a bench f, rock or low leafy tree with the conventional electric lawn mower, it is impossible to cut all the grass because the housing e obstructs such action. Furthermore, since the line head d is coupled directly to the motor a, the cutting torque is insufficient when overloaded. Thus, the conventional electric lawn mower is low in cutting efficiency, and the motor is liable to be overheated.

Accordingly, an object of this invention is to substantially eliminate the above-described deficiencies of a conventional electric lawn mower. More specifically, an object of the invention is to provide an electric lawn mower which is higher in work efficiency and in cutting torque than the conventional one.

This invention in one broad form, provides an electric lawn mower comprising a line head having flexible strip edges wound thereon;

a housing having an upper portion and a lower portion;

said housing formed so that it has a flared profile wherein an upper leading surface of the housing becomes gradually more flattened towards the front of said mower;

said line head being rotatably supported by a spindle rotatable about a vertical axis thereof;

an electric motor being provided in said housing, the axis of the output shaft of said motor being substantially horizontal;

said output shaft being coupled through a reduction gear mechanism to said spindle.

By way of example only, one preferred embodiment of a lawn mower according to this invention will now be described with reference to the accompanying drawings wherein:

Fig. 1 is a longitudinal sectional side view showing one example of an electric lawn mower according to this invention;

Fig. 2 is a plan view, partly as a sectional view, taken in the direction of arrow II-II in Fig. 1;

FIG. 3 is a side view showing one example of the use of the electric lawn mower according to the invention;

FIG. 4 is a side view of a conventional electric lawn mower;

FIG. 5 is a side view showing one example of the use of the conventional electric lawn mower.

Fig. 6 is a side view of a second embodiment of the invention.

As shown in FIGS. 1 and 2, a housing 1, which is substantially a lawn mower body is formed by combining right and left plastic housing parts 1b and 1a with screws 2. The housing 1 has a base end portion 1c to which handle pipe 3 is connected in such a manner that it extends obliquely upwardly and rearwardly of the housing 1, and a front end portion 1d. The housing 1 is so shaped that its height decreases gradually from the base end portion 1c to the front end portion 1d so that the latter portion 1d can be readily placed under a bench, rock overhang or low leafy tree.

A casing 5 is fixedly secured to the housing part 1a near the front end portion 1d of the housing 1 with screws 2. A spindle 4 is rotatably supported through bearings 6 and 7 between the housing part 1a and the casing 5 in such a manner that it extends vertically relative to horizontal ground. The lower end portion of the spindle 4 is fixedly coupled to a line head 9 on which flexible strip edges 8 of "Nylon" or the like are spirally wound with their ends outside. As the line head 9 is rotated together with the spindle 9, the edges 8 are rotated in a horizontal plane resulting in the edges being unwound by centrifugal force the edges 8 thus cutting grass on a lawn.

An electric motor 10 is located in the housing 1 in such a manner that its output shaft 10a extend towards the front end portion 1d and is in parallel with the above-described flexible strip edges 8. The horizontal output shaft 10a is rotatably supported through bearings 11 and 11' between the housing part 1a and the casing 5 and between the housing parts 1a and 1b. Bevel gears 12 and 13 forming a reduction gear mechanism 14 are fixedly mounted on the output shaft 10a and the spindle 4, respectively; that is, the output shaft 10a is coupled through the reduction gear mechanism 14 to the spindle 4, so that the line head 9 is rotated at a predetermined speed by the motor 10, and a space 17 is formed over the flexible strip edges 8.

The casing 5 is made of metal much higher in thermal conductivity than plastics for the following purpose: Heat is generated by the friction between the gears 12 and 13 in the reduction gear mechanism 14, by the

friction between the motor shaft 10a and the gearing 11, and by the friction between the spindle 4 and the bearings 6 and 7. However, in this case, a motor fan 15 is provided to cool the metal casing 5 thereby to effectively cool the members.

FIG. 3 shows a state of use of the lawn mower according to this embodiment of the invention. In the case where a bench 16 or the like is provided in the lawn as shown in FIG. 3, the flexible strip edges 8 can be inserted under the bench 16 to the extent that they substantially reach the supporting post 16a of the bench, because the aforementioned space 17 is provided above the edges 8. If the front end portion 1d of the housing 1 is made smaller in height as illustrated, then the flexible strip edges 8 can be inserted into a narrow space.

Referring to Fig. 6 a second embodiment of the invention is shown wherein an inlet 20 is provided at an upper rear portion of housing 1 whilst an outlet 30 is provided at a lower rear portion of the housing 1. Inside housing 1 an air passage is provided to allow air to pass through the whole of the inside of the housing 1. A motor can be used to drive a fan in order to force air over the components within the housing 1. Preferably air enters at inlet 20 and exits through outlet 30 after passing over the heat generating components within the casing 1.

Air from outlet 30 can be directed at the exterior bottom surface of the housing 1 in order to prevent cut grass from adhering to the surface.

Effects of the Invention

As described above, in the electric lawn mower of the invention, the motor 10 is built in the housing 1 in such a manner that it is substantially in parallel with the flexible strip edges 8, and the motor shaft 10a is coupled through the reduction gear mechanism 14 to the spindle 4, so that the space 17 is provided above the flexible strip edge. Therefore, in a lawn having benches, rocks or low leafy trees, the flexible strip edges 8 can be inserted sufficiently deeply into the spaces or corners below them. Accordingly, with the electric lawn mower of the invention, grass can be cut at such narrow spaces or corners with comparative ease. Furthermore, since the rotation of the motor is transmitted through the reduction gear mechanism 14 to the spindle 4, the torque of the line head 9 is increased. This prevents reduction in speed of the line head 9 due to overload. Accordingly, grass on lawns can be evenly cut with this lawn mower. In addition, deterioration of motor 10 by overheating is at least substantially reduced.

With the embodiment of Fig. 6 the components of the mower can be efficiently cooled. The cooling air can also be used to prevent the lodgement of cut grass particles on the underside of the casing 1.

The above describes only two embodiments of the present invention and modifications, obvious to those skilled in the art, can be made thereto without departing from the scope and spirit of the present invention.

The claims defining the invention are as follows:

1. An electric lawn mower comprising a line head having flexible strip edges wound thereon;

a housing having an upper portion and a lower portion;

said housing formed so that it has a flared profile wherein an upper leading surface of the housing becomes gradually more flattened towards the front of said mower;

said line head being rotatably supported by a spindle rotatable about a vertical axis thereof;

an electric motor being provided in said housing, the axis of the output shaft of said motor being substantially horizontal;

said output shaft being coupled through a reduction gear mechanism to said spindle.

2. The electric lawn mower of claim 1 further including air cooling means comprising an air inlet passage to receive air from the external environment and an air exit passage to exhaust air to said external environment;

said air being directed over the components within said housing in order to cool said components.

3. The electric lawn mower of claim 2 wherein said air inlet is located at an upper rear portion of said housing and said exit is located at a lower rear portion of said housing.

4. The electric lawn mower of any preceding claim wherein a flow of air is directed at an underside surface of the casing in order to prevent grass cuttings and the like adhering thereto.

5. The electric lawn mower of claim 3 wherein cooling air exiting from said exit is utilized to prevent grass particles and the like from adhering to the underside of said casing.

6. An electric lawn mower as defined in claim 1 further comprising a fan located within said housing adapted to cool said motor during operation.

7. An electric lawn mower substantially as described herein with reference to and as illustrated by Figs. 1 to 3 of the accompanying drawings.

8. An electric lawn mower substantially as described herein with reference to Fig. 6.

DATED this TWENTY-THIRD day of APRIL 1990
Ryobi Ltd

Patent Attorneys for the Applicant
SPRUSON & FERGUSON

KLN/22941

FIG. 1

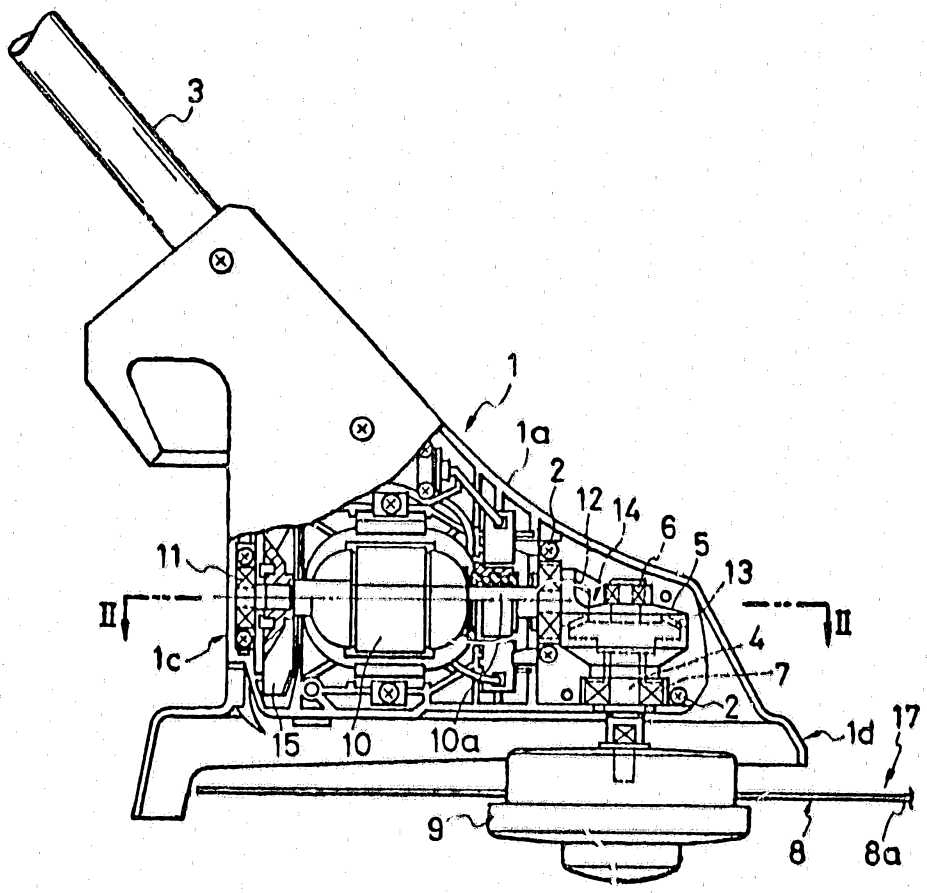


FIG. 2

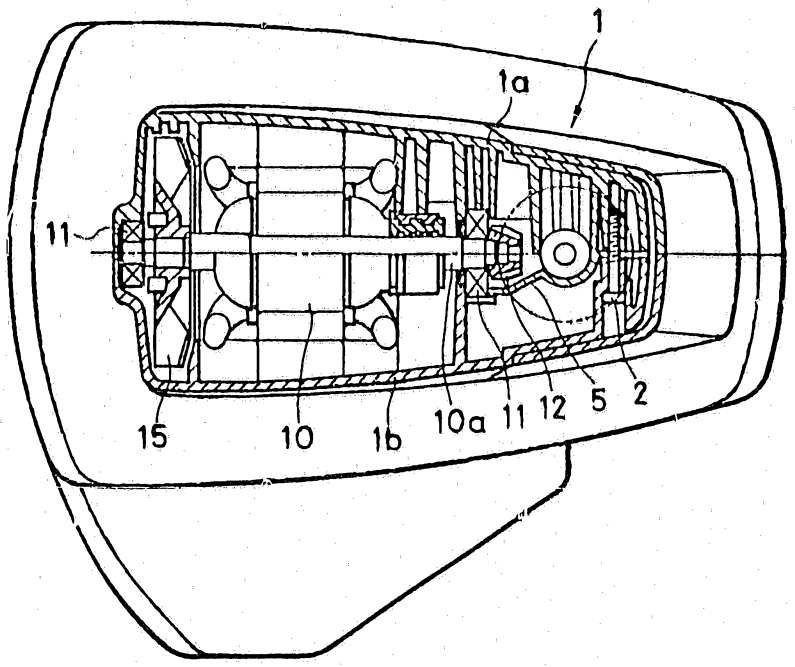


FIG. 3

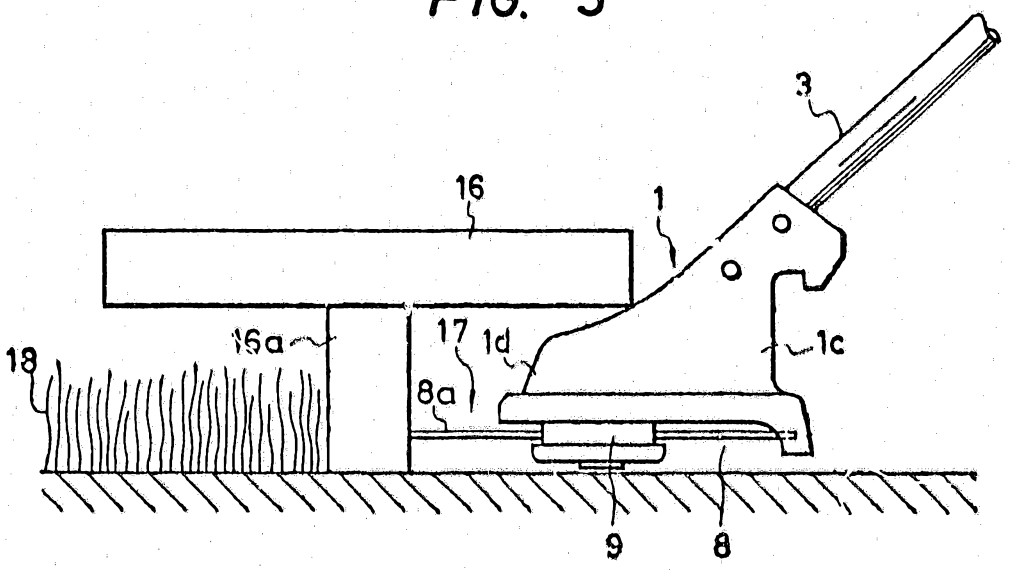


FIG. 4

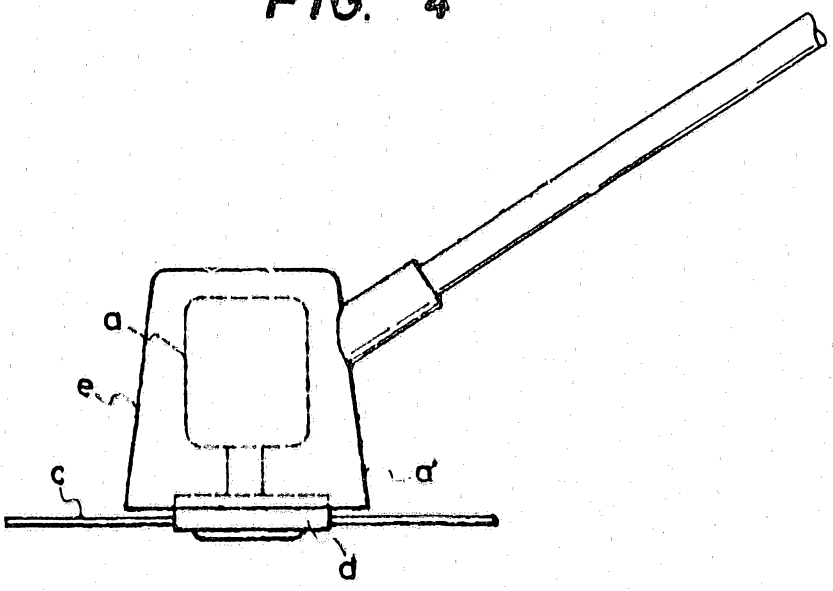


FIG. 5

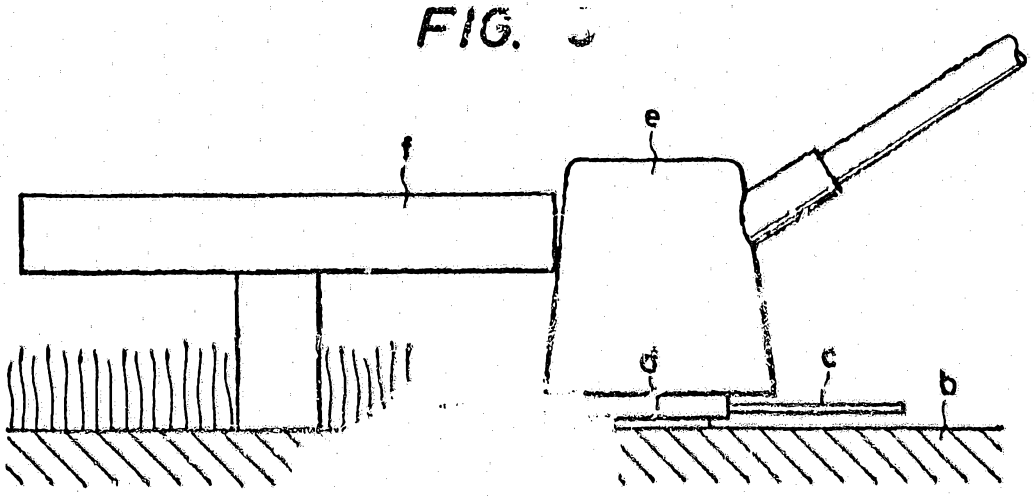
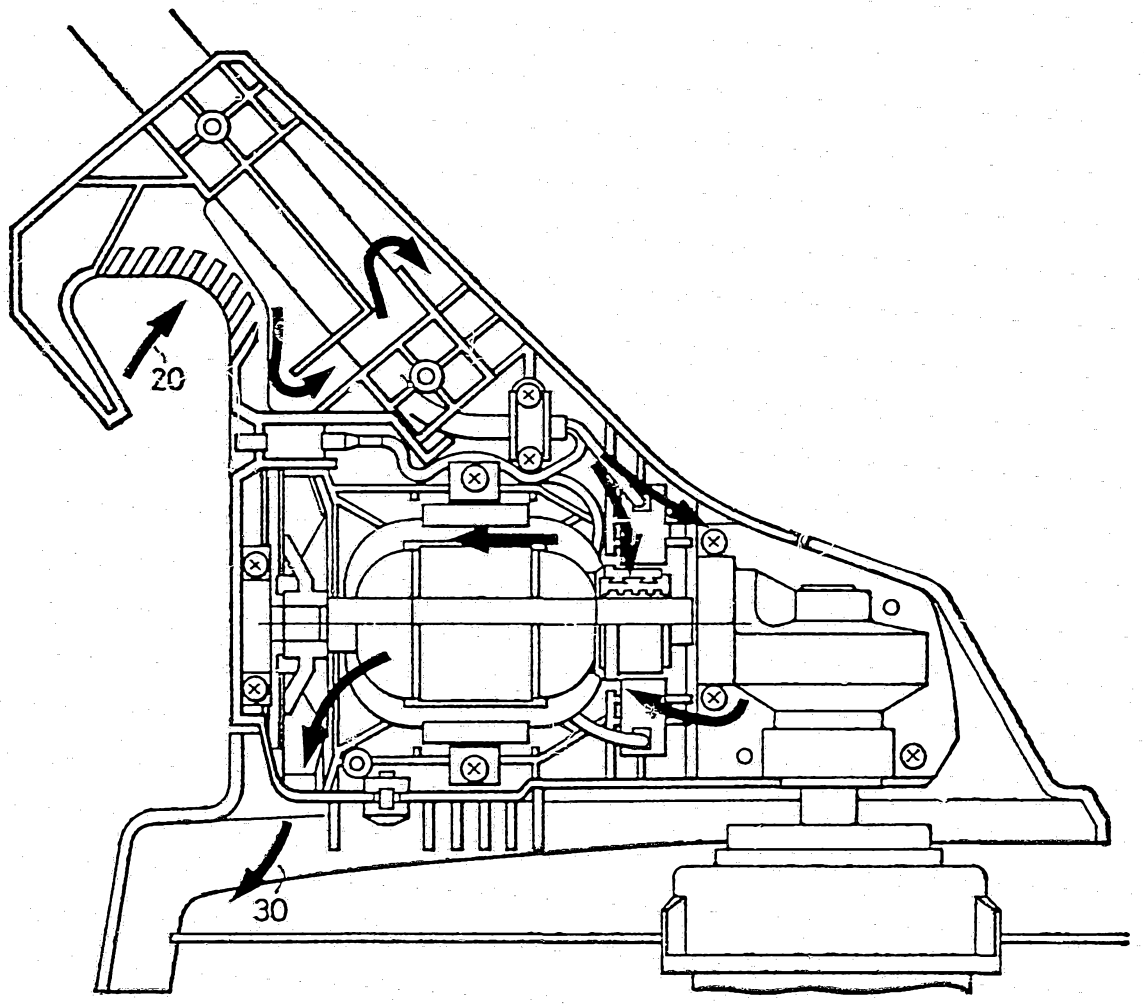


FIG. 6



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