608637

FORM 1
REGULATION 9

COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952-1973

APPLICATION FOR A PATENT

We ISHIHARA SANGYO KAISHA LTD.

of No. 3-22, Edobori 1-chome, Nishi-ku, Osaka, JAPAN

hereby apply for the grant of a Patent for an invention entitled:

"Herbicidal compositions containing optionally substituted pyridine sulfonamides plus other herbicidal agents."

which is described in the accompanying complete specification. This Application is a Convention Application and is based on the Application(s) numbered: 62-199287 and 63-136043 for a Patent or similar protection made in Japan on 10th August, 1987 and 2nd June, 1988 respectively.

Our address for service is:

GRIFFITH HACK & CO.
71 YORK STREET
SYDNEY N.S.W. 2000
AUSTRALIA

DATED this 4th day of August, 1988.

ISHIHARA SANGYO KAISHA LTD.
By their Patent Attorneys

GRIFFITH HACK & CO.

AUSTRALIAN PATENT OFFICE

TO: THE COMMISSIONER OF PATENTS
COMMONWEALTH OF AUSTRALIA

S001502 04/08/88
7707A/bm

APPLICATION ACCEPTED AND AMENDMENTS
16-1-91

Australia Patent Declaration Form

Forms 7 and 8

AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

Name(s) of Applicant(s)

In support of the application made by Ishihara Sangyo Kaisha Ltd.

Title

for a patent for an invention entitled HERBICIDAL COMPOSITION

Name(s) and address(es) of person(s) making declaration

I, Kenzo ISHIHARA of No. 3-22, Edobori 1-chome, Nishi-ku, Osaka, Japan

do solemnly and sincerely declare as follows:-

1. I am authorised by the above-mentioned applicant to make this declaration on its behalf.

2. The basic application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date(s) by the following applicant(s) namely:-

Country, filing date and name of Applicant(s) for the or each basic application

in Japan on August 10, 19 87
by Ishihara Sangyo Kaisha Ltd.
in Japan on June 2, 19 88
by Ishihara Sangyo Kaisha Ltd.

3. The said basic application(s) was/were the first application(s) made in a Convention country in respect of the invention the subject of the application.

Name(s) and address(es) of the or each actual inventor

4. The actual inventor(s) of the said invention is/are Fumio KIMURA, Takahiro HAGA, Nobuyuki SAKASHITA, Chimoto HONDA and Shigeo MURAI, whose post office address is c/o Ishihara Sangyo Kabushiki Kaisha Chuo Kenkyusho, 3-1, Nishishibukawa 2-chome, Kusatsu-shi, Shiga-ken, Japan

See reverse side of this from for guidance in completing this part

5. The facts upon which the applicant(s) is/are entitled to make this application are as follows:-
The applicant is the assignee of the actual inventors.

DECLARED at Tokyo, Japan this 8th day of July, 1988

Ishihara Sangyo Kaisha Ltd.

Kenzo Ishihara

Kenzo ISHIHARA, Chairman

(12) PATENT ABRIDGMENT (11) Document No. AU-B-20498/88
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 608637

(54) Title
HERBICIDAL COMPOSITIONS CONTAINING OPTIONALLY SUBSTITUTED PYRIDINE SULFONAMIDES

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62-199287	10.08.87	JP JAPAN
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(44) Publication Date of Accepted Application : 11.04.91

(71) Applicant(s)
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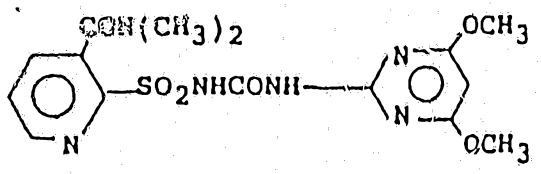
(56) Prior Art Documents
JP 62-78588

(57) Claim

1. A herbicidal composition characterized by comprising as the effective components a pyridinesulfonamide compound of the formula (I):



(I)

and at least one compound selected from the group consisting of 2,4-dichlorophenoxy acetic acid, its sodium salt, its dimethylammonium salt, its ethylester, and 3,5-dibromo-4-hydroxybenzonitrile with a mixing ratio of 1:1 to 40.

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COMMONWEALTH OF AUSTRALIA

PATENTS ACT 1952 Form 10

COMPLETE SPECIFICATION

FOR OFFICE USE

Short Title:

Int. Cl:

Application Number:
Lodged:

This document contains the amendments made under Section 49 and is correct for printing.

Complete Specification-Lodged:
Accepted:
Lapsed:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant: ISHIHARA SANGYO KAISHA LTD.

Address of Applicant: No. 3-22, Edobori 1-chome, Nishi-ku, Osaka, JAPAN

Actual Inventor: FUMIO KIMURA; TAKAHIRO HAGA; NOBUYUKI SAKASHITA; CHIMOTO HONDA and SHIGEO MURAI

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71 YORK STREET
SYDNEY NSW 2000
AUSTRALIA

Complete Specification for the invention entitled:
"Herbicidal compositions containing optionally substituted pyridine sulfonamides plus other herbicidal agents."

The following statement is a full description of this invention, including the best method of performing it known to us:-
7707A/bm

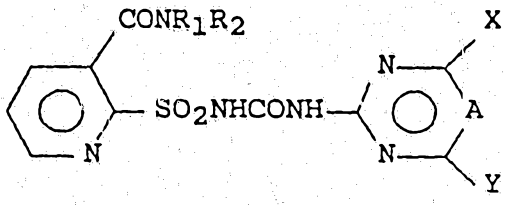
Background of the Invention

1. Field of the Invention:

The present invention relates to a herbicidal composition comprising as the effective components at least one compound selected from among pyridinesulfonamide compounds and their salts, and at least one other specific herbicidal compound.

2. Description of the Prior Art:

Japanese patent application No. 62-8286 (published on August 5, 1987 as publication No. KOKAI 62-178588) discloses herbicidal pyridinesulfonamide compounds having the formula:



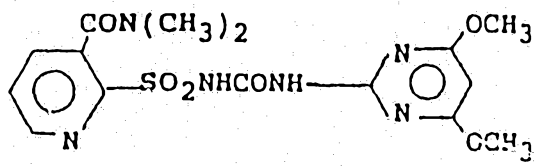
wherein R_1 and R_2 are a hydrogen atom or an alkyl group, X and Y are a methyl group or a methoxy group, and A is =CH- group or =N- group, and their salts. And this patent application further discloses that the above described pyridinesulfonamide compounds may be mixed with another herbicidal compound, such as 3,6-dichloro-2-methoxybenzoic acid, 3-(1-methylethyl)-1H-2,1,3-benzothiadiazin-4(3H)-one-2,2-dioxide, 2-(4-chloro-6-ethylamino-1,3,5-triazin-2-ylamino)-2-methyl propionitrile, 2-chloro-4-ethylamino-6-isopropylamino-1,3,5-triazine, ethyl 2,4-dichlorophenoxy acetate,

2-(3,5-dichlorophenyl)-2-(2,2,2-trichloroethyl)oxirane, N-(1-ethylpropyl)-2,6-dinitro-3,4-xylidine, 2-chloro-2',6'-diethyl-N-(methoxymethyl)acetanilide, 2-chloro-6'-ethyl-N-(2-methoxy-1-methylethyl)aceto-o-toluidide and the like, without showing specific biological test data.

European patent application Nos. 87300502.9 (published on August 12, 1987 as publication No. 232,067) and 87301954.1 (published on September 16, 1987 as publication No. 237,292) also disclose partly that the above described pyridinesulfonamide compounds may be mixed with another herbicidal compound such as those described in Japanese patent application No. 62-8286, without showing specific biological test data.

Summary of the Invention

The present invention provides a herbicidal composition characterized by comprising as the effective components a pyridinesulfonamide compound of the formula (I):



(I)

and at least one compound selected from the group consisting of 2,4-dichlorophenoxy acetic acid, its sodium salt, its dimethylammonium salt, its ethylester, and 3,5-dibromo-4-hydroxybenzonitrile with a mixing ratio of 1:1 to 40.

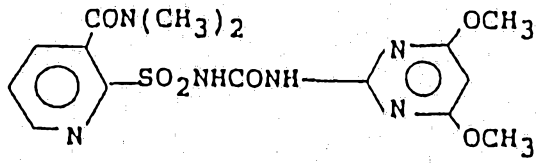
The herbicidal composition of the present invention provides a wider weeding spectrum than the use of any individual compound alone, and sufficient weed-killing effect throughout the entire period of growth of corns by spraying

only once.

Detailed Description of the Preferred Embodiment

In general, many kinds of weeds coexist and grow together but the periods of germination and growth differ from weed to weed. This inevitably results in spraying of a herbicide on many kinds of weeds in different stages of growth. As a matter of fact, it is considerably difficult to kill every weed by spraying a herbicide thereon only once. If some weeds remain alive, some of them will grow later and others will regerminate even if parts of them above the ground have been killed once, with the result that they will grow thick eventually. In this case, therefore, the effect of spraying a herbicide is halved. Accordingly, there still is a strong demand for development of a herbicide which has a wide weeding spectrum, is effective for fully-grown weeds, and can maintain the weed-controlling effect thereof for a desired period of time.

The instant applicant previously filed a patent application (Japanese Patent Application No. 62-17,323) on the basis of a finding that pyridinesulfonamide compound represented by the formula (I):



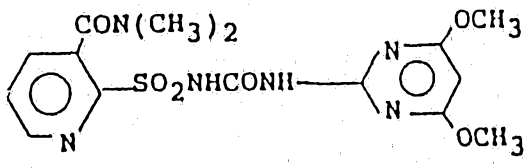
(I)

has a very high weed-killing effect for a wide variety of weeds including highly harmful weeds while showing highly safe levels for corns. However, it sometimes happens that

the compound cannot perfectly exterminate some particular kinds of weeds though it depends on conditions involving the amount and time of application thereof, and that new weeds grow from soil in actual fields after application of the compound.

As a result of experiments made on combinations of the pyridinesulfonamide compound of the formula (I) with various herbicidal compounds with a view to solving the above-mentioned problems, the inventors of the present invention have found that the use of a mixture of a pyridinesulfonamide compound of the formula (I) with at least one other specific herbicidal compound as will be mentioned later provides a wider weeding spectrum than the use of any individual compound alone, and that a sufficient weed-killing effect can be maintained through the whole period of growth of corns by spraying such a mixture only once. The present invention has been completed based on these findings.

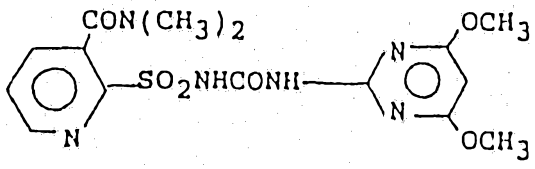
More specifically, in accordance with the present invention, there is provided a herbicidal composition characterized by comprising as the effective components a pyridinesulfonamide compound of the formula (I):



(I)

and at least one compound selected from the group consisting of 2,4-dichlorophenoxy acetic acid, its sodium salt, its dimethylammonium salt, its ethylester, and 3,5-dibromo-4-hydroxybenzonitrile with a mixing ratio of 1:1 to 40.

The pyridinesulfonamine compound A-I is represented by the formula (I)



(I)

and has a melting point range of 169-173°C. Specific herbicidal compounds which can be used in admixture with the pyridinesulfonamide compound represented by the formula (I) include those well known under trade names or general terms as will be mentioned in the following Table 1.

Table 1

Compound No.	Name of Compound	Trade Name or General Term
B-1	2,4-dichlorophenoxy acetic acid	2,4-D
B-2	sodium 2,4-dichlorophenoxy acetate	"
B-3	dimethylammonium 2,4-dichlorophenoxy acetate	"
B-4	ethyl 2,4-dichlorophenoxy acetate	"
B-5	3,5-dibromo-4-hydroxy-benzonitrile	Bromoxynil

The mixing ratio (by weight) of the pyridinesulfonamide compound represented by the formula (I) to the other specific herbicidal compound is generally 1:1 to 1:40, desirably 1:1 to 1:20. The suitable amount of application of the compounds cannot uniquely be determined because it varies depending on the form of preparation, the time of application, the kind of object weed, and the like. In general, however, the amount of the pyridinesulfonamide compound represented by the formula (I) is about 0.05 to 10 g/a, while the amount of the other specific herbicidal compound is about 0.05 to 40 g/a.

The herbicidal composition of the present invention

can be applied to a wide variety of sites including upland fields, orchards, mulberry fields, forests, agricultural roads, grounds, and factory sites. The method of application of the herbicidal composition can be arbitrarily chosen from a soil treatment application and a foliage treatment application.

The herbicidal composition of the present invention is prepared by blending various adjuvants with the pyridinesulfonamide compound of the formula (I) and the other specific herbicidal compound to form an emulsifiable concentrate, a wettable powder, a suspension concentrate, granules, a dust, a water-soluble powder or the like according to any customary method of preparing an agricultural preparation. The pyridinesulfonamide compound of the formula (I) and the other specific herbicidal compound may be either mixed together and formed into a preparation, or formed into separate preparations and then mixed with each other. Examples of the above-mentioned adjuvants include solid carriers such as diatomaceous earth, slaked lime, calcium carbonate, talc, white carbon, kaoline, bentonite, jeaklite, water soluble starch, and sodium bicarbonate; solvents such as toluene, xylene, solvent naphtha, ethanol, dioxane, acetone, isophorone, methyl isobutyl ketone, dimethylformamide, dimethylsulfoxide, and N-methyl-2-pyrrolidone; spreaders and surfactants such as sodium alkylsulfates, sodium alkylbenzenesulfonates, sodium lignosulfonate,

polyoxyethylene glycol alkyl ethers, polyoxyethylene lauryl ether, polyoxyethylene alkylaryl ethers, polyoxyethylene fatty acid esters, and polyoxyethylene sorbitan fatty acid esters; and vegetable oils and mineral oils such as olive oil, kapok oil, castor oil, papaya oil, camellia oil, coconut oil, sesame oil, corn oil, rice bran oil, peanut oil, cotton seed oil, soybean oil, rape seed oil, linseed oil, tung oil and liquid paraffin.

Description will now be made of examples of formulation of the herbicidal composition of the present invention, which, however, are not limitative.

Formulation Example 1:

(1)	Compound No. A-1	1 part by weight
(2)	Each of Compound Nos. B-1 to B-5	2.5 parts by weight
(3)	Dikssol W-92	2 parts by weight
(4)	Newlite	94.5 parts by weight

The above-mentioned components are mixed and pulverized to obtain a dust.

Formulation Example 2:

(1)	Compound No. A-1	5 parts by weight
(2)	Each of Compound Nos. B-1 to B-5	37.5 parts by weight
(3)	Dikssol W-66	5 parts by weight
(4)	Dikssol W-0913	2 parts by weight
(5)	diatomaceous earth	50.5 parts by weight

The above-mentioned components are mixed to obtain a wettable powder.

Formulation Example 3:

(1)	Compound No. A-1	5 parts by weight
(2)	Each of Compound Nos. B-1 to B- 5	50 parts by weight
(3)	Sorpol 5050	3 parts by weight
(4)	Sorpol 5073	4 parts by weight
(5)	Hi-Filler No. 10	38 parts by weight

The above-mentioned components are mixed to obtain a wettable powder.

Formulation Example 4:

(1)	Compound No. A-1	1 part by weight
(2)	Each of Compound Nos. B-1 to B- 5	15 parts by weight
(3)	Sorpol 5039	5 parts by weight
(4)	Lavelin S	2 parts by weight
(5)	Carplex #80	15 parts by weight
(6)	kaoline	62 parts by weight

The above-mentioned components are mixed to obtain a wettable powder.

Formulation Example 5:

(1)	Compound No. A-1	0.1 part by weight
(2)	Each of Compound Nos. B-1 to B-5	1 part by weight
(3)	Dikssol W-92	2 parts by weight
(4)	Newlite	96.9 parts by weight

The above-mentioned components are mixed and pulverized to obtain a dust.

Formulation Example 6:

(1)	Compound No. A-1	1 part by weight
(2)	Each of Compound Nos. B-1 to B-5	20 parts by weight
(3)	Dikssol W-66	5 parts by weight
(4)	Dikssol W-0913	2 parts by weight
(5)	diatomaceous earth	72 parts by weight

The above-mentioned components are mixed to obtain a wettable powder.

Formulation Example 7:

(1)	Compound No. A-1	20 parts by weight
(2)	Each of Compound Nos. B-1 to B-5	40 parts by weight
(3)	Sorpol 5039	5 parts by weight
(4)	Lavelin S	2 parts by weight
(5)	kaoline	33 parts by weight

The above-mentioned components are mixed to obtain a wettable powder.

Formulation Example 8:

(1)	Compound No. A-1	4 parts by weight
(2)	Each of Compound Nos. B-1 to B-5	30 parts by weight
(3)	Dikssol W-66	5 parts by weight
(4)	Dikssol W-0913	2 parts by weight
(5)	diatomaceous earth	59 parts by weight

The above-mentioned components are mixed to obtain a wettable powder.

Formulation Example 9:

(1)	Compound No. A-1	0.2 part by weight
(2)	Each of Compound Nos. B-1 to B-5	1 part by weight
(3)	Dikssol W-92	2 parts by weight
(4)	Newlite	96.8 parts by weight

The above-mentioned components are mixed and pulverized to obtain a dust.

Formulation Example 10:

(1)	Compound No. A-1	5 parts by weight
(2)	Each of Compound Nos. B-1 to B-5	5 parts by weight
(3)	Dikssol W-66	5 parts by weight
(4)	Dikssol W-0913	2 parts by weight
(5)	diatomaceous earth	83 parts by weight

The above-mentioned components are mixed to obtain a wettable powder.

Formulation Example 11:

(1)	Compound No. A-1	40 parts by weight
(2)	Each of Compound Nos. B-1 to B-5	10 parts by weight
(3)	Sorpol 5039	5 parts by weight
(4)	Lavelin S	2 parts by weight
(5)	Carplex #80	15 parts by weight
(6)	kaoline	28 parts by weight

The above-mentioned components are mixed to obtain a wettable powder.

Formulation Example 12:

(1) Compound No. A-1 3 parts by weight

(2) Each of Compound Nos. B-1 to B-3 and B-5 2 parts by weight

(3) corn oil 81 parts by weight

(4) Sorpol 3815 12 parts by weight

(5) bentonite-alkylamine complex 2 parts by weight

The above-mentioned components are mixed uniformly and pulverized by Dyno-Mill (Willy A. Bachofen AG) to obtain a suspension concentrate.

[Notes]

Dikssol W-92, W-96 and W-0913, and Lavelin S:

trade name of products manufactured by Dai-ichi Kogyo Seiyaku Co., Ltd.

Newlite:

trade name of a product manufactured by Nippon Taikagenryo Co., Ltd.

Sorpol 5050, 5073, 5039, 3815:

trade name of products manufactured by Toho Chemical Co., Ltd.

Hi-Filler No. 10:

trade name of a product manufactured by Matsumura Sangyo Co., Ltd.

Carplex #60:

trade name of a product manufactured by Shionogi & Co., Ltd.

As examples of biological tests on the herbicidal composition of the present invention, description will now be made of Test Examples, which, however, are not limitative.

Test Example 1:

1/3,000 are (a) pots and 1/10,000 are (a) pots were filled with upland soil. Corn (variety: Royal Dent 105T) was sown in the 1/3,000 are pots, while velvetleaf, sicklepod and common lambsquarters were sown in the 1/10,000 are pots respectively.

When the test plants reached respective given growth stage (a 4.2-leaf stage for corn, a 2.5-leaf stage for velvetleaf, a 1.2-leaf stage for sicklepod and a 2 to 4-leaf stage for common lambsquarters), a predetermined amount of a herbicidal composition which was diluted in 5 liters, per are (a), of water to prepare an aqueous solution to which an agricultural spreader was then added in an amount of 0.2% by volume based on the total, was foliarly applied to the plants with a small spray gun. The progress of growth of the plants was visually observed 26 days after the application to evaluate the degree of growth control according to 10 ratings (1: the same as in an untreated plot - 10: perfect growth control). The results are shown in Table 2.

Table 2

Compound No. A-1 and Amount Thereof (g/a) / Mixing Partner Compound and Amount Thereof (g/a)		Degree of Growth Control											
		Subject Plants											
		corn				velvetleaf				sicklepod			
		1.25	0.625	0.312	0	1.25	0.625	0.312	0	1.25	0.625	0.312	0
B-3	4	2	2	2	2	10	10	10	10	10	9	9	9
	2	2	2	2	2	10	10	9	10	8	8	7	7
	1	2	2	2	2	9	8	8	8	7	7	7	5
	0	1	1	1	-	7	6	6	-	7	7	4	-

Table 2 (continued)

Compound No. A-1 and Amount Thereof (g/a) / Mixing Partner Compound and Amount Thereof (g/a)		Degree of Growth Control			
		Subject Plants			
		common lambsquarters			
		1.25	0.625	0.312	0
B-3	4	10	10	10	10
	2	10	10	10	10
	1	10	10	10	10
	0	7	6	5	-

Supplemental Plant Test

1/10,000 are (a) (1/100 m^2) pots were filled with upland soil and velvet leaf (Abutilon theophrasti) were sown therein.

When the test plants reached 2.3-leaf stage, a predetermined amount of a herbicidal composition (40% wettable powder of the compound No. A-1 together with either 49.5% emulsifiable concentrate of dimethylammonium 2,4-dichlorophenoxy acetate (2,4-D), or 24% emulsifiable concentrate of 3,5-dibromo-4-hydroxybenzonitrile (bromoxynil) which was diluted in 5 l/are(a) of water to prepare an aqueous solution to which an agricultural spreader was then added in an amount of 0.2% by volume, was foliarly applied to the plants with a small spray gun.

Eighteen days after the application, the fresh weights of the residual plants from ground level upward were measured and the degree of the residual plants (%) were calculated by the following equation:

$$\text{Degree of residual plants (\%)} = \frac{\text{Residual weight in treated pot}}{\text{Residual weight in non-treated pot}} \times 100$$

Each of the degree of the residual plants (%) in the pots of the present invention was compared with the theoretical value calculated by the following COLBY Equation:

COLBY Equation

$$\text{Theoretical value (\%)} = \frac{\text{Degree of residual plants in the plot of the compound No. A-1} \times \text{Degree of residual plants in the plot of the compound}}{100}$$

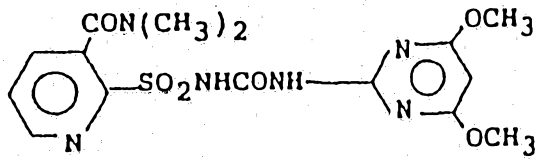
Table 3

Compound No. A-1 and Amount Thereof (g/a) / Amount of Test Compound (g/a)		Degree of the Residual Plants (%)			
		0	0.15	0.30	0.60
	0	100	39.7	24.6	7.9
2,4-D	1.00	69.4	19.2 (27.6)	13.8 (17.1)	0.8 (5.5)
	2.00	17.2	3.0 (6.8)	0 (4.2)	0 (1.4)
bromoxynil	0.3125	68.1	15.8 (27.0)	6.7 (16.7)	6.6 (5.4)

Note: Figures in parentheses are the theoretical values.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A herbicidal composition characterized by comprising as the effective components a pyridinesulfonamide compound of the formula (I):



(I)

and at least one compound selected from the group consisting of 2,4-dichlorophenoxy acetic acid, its sodium salt, its dimethylammonium salt, its ethylester, and 3,5-dibromo-4-hydroxybenzonitrile with a mixing ratio of 1:1 to 40.

2. A herbicidal composition substantially as herein described with reference to any one of the foregoing Formulation Examples.

3. A herbicidal composition according to claim 1 or claim 2, when applied to foliage or soil.

DATED this 3rd day of January 1991

ISHIHARA SANGYO KAISHA LTD

By their Patent Attorneys

GRIFFITH HACK & CO.