

COMMONWEALTH OF AUSTRALIA

Patents Act 1952-1969

CONVENTION APPLICATION FOR A PATENT

(1) Here  
Insert (in  
full) Name  
or Names of  
Applicant or  
Applicants,  
followed by  
Address (es).

MX (1) WILLIAMES HI-TECH INTERNATIONAL PTY. LTD.,  
We of Wills Street,  
Warragul, Victoria 3820, Australia.

(2) Here  
Insert Title  
of Invention.

hereby apply for the grant of a Patent for an invention entitled: (2)

TEA HARVESTING EQUIPMENT

(3) Here insert  
number(s)  
of basic  
application(s)

which is described in the accompanying complete specification. This application is a Convention application and is based on the application numbered (3)

(4) Here insert  
Name of basic  
Country or  
Countries, and  
basic date or  
dates

878/DEL/88  
for a patent or similar protection made in (4) India on  
on 14th October, 1988.

MX Our address for service is Messrs. Edwd. Waters & Sons, Patent Attorneys,

50 Queen Street, Melbourne, Victoria, Australia.

DATED this 17th day of April, 19 89

(5) Signature (s) of  
Applicant (s)  
or  
Seal of  
Company and  
Signatures of  
Its Officers as  
prescribed by  
the Act of  
Association.

(5)

WILLIAMES HI-TECH INTERNATIONAL  
PTY. LTD.

By:

STEPHEN K. PLYMIN

18/04/89

To:

THE COMMISSIONER OF PATENTS.

# DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT OR PATENT OF ADDITION

(1) Here  
insert (in  
full) Name of  
Company.

In support of the Convention Application made by<sup>(1)</sup>.....

WILLIAMES HI-TECH INTERNATIONAL PTY LTD.....

(2) Here  
insert title  
of Invention.

(hereinafter referred to as the applicant) for a patent for an invention entitled<sup>(2)</sup>.....

"TEA HARVESTING EQUIPMENT"

(3) Here  
insert full Name  
and Address  
of Company  
official  
authorized  
to make  
declaration.

I,<sup>(3)</sup> Geoffrey Allan Williames.....

of..... Wills Street, Warragul, Victoria, 3820, Australia.....

do solemnly and sincerely declare as follows:

1. I am authorised by the applicant for the patent to make this declaration on its behalf.

2. The basic application as defined by Section 141 of the Act was.....  
made in<sup>(4)</sup>..... India.....  
on the..... 14th..... day of..... October,..... 1988, by.....  
.....

on the..... day of..... 19....., by.....

..... WILLIAMES HI-TECH INTERNATIONAL PTY LTD.....

3.<sup>(5)</sup>..... GEOFFREY ALLAN WILLIAMES.....  
..... of Wills Street, Warragul, Victoria, 3820, Australia.....

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

The applicant is the assignee of ....the...actual...inventor.....

.....

4. The basic application referred to in paragraph 2 of this Declaration was.....  
.....the first application made in a Convention country in respect of the invention  
the subject of the application.

DECLARED at..... Warragul.....  
this..... 4th..... day of..... February..... 1981.....

(6) Signature.

(6)

To: THE COMMISSIONER OF PATENTS.

(12) PATENT ABRIDGMENT (11) Document No. AU-B-33097/89  
(19) AUSTRALIAN PATENT OFFICE (10) Acceptance No. 615050

(54) Title  
TEA HARVESTING EQUIPMENT

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(51)<sup>5</sup> A01D 034/43

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(57) The objective of this invention is to provide improved harvesting machinery that will efficiently cut the desired upper new growth leaves and collect same delivering them to a storage zone prior to subsequent processing steps.

Tea plantations commonly arrange tea bushes in rows which may be evenly spaced or not. Adjacent bushes in each row tend to grow into one another to form a hedge. In some plantations, shade trees are grown in certain rows in the belief that the shade provided by the canopy of these trees enhances growth in the tea bushes. The difficulty for mechanical harvesting is, however, that these shade trees obstruct passage of the harvesting equipment.

#### CLAIM

1. Tea harvesting apparatus comprising an elevated support platform frame, transportation means depending from said frame and laterally spaced to move between adjacent rows of tea bushes with said frame passing over one or more rows of tea bushes, cutting means movably supported from said frame extending across a zone below said frame between said laterally spaced transportation means, said cutting means being mounted on a movable chute for conveying cut tea leaves rearwardly to a storage bin, said movable chute engaging with a stationary passage means leading to said storage bin, and means for establishing vacuum conditions in said movable chute and said passage means for moving said cut tea leaves to said storage bin, said harvesting

equipment being characterised by said cutting means comprising at least one cutter bar forming at least one complete helix mounted on a rotatable shaft, said cutter bar co-operating with a stationary cutter element mounted on said movable chute, said rotatable shaft being rotated at a speed responsive to the forward speed of said harvesting equipment.

5. Tea harvesting apparatus according to any one of Claims 1 to 4, further including auxiliary cutter means comprising cutter elements, in a normal position, extending laterally from said frame in a manner enabling pivotal movement of said cutter elements about an upright axis located at or adjacent said frame, a rotatable buffer located at an outer free end of said cutter elements capable of rotation about an upright axis, and means for resiliently holding the cutter elements in said normal operating position but permitting movement therefrom under action of forces applied to said rotatable buffer.

6. Tea harvesting apparatus according to any one of Claims 1 to 5, wherein said vacuum forming means is arranged to withdraw air from said bin and said movable chute and said passage means ~~to create said vacuum conditions with a higher degree of vacuum in said movable chute and passage means relative to said storage bin~~, and a rotatable discharge valve located in a lower region of said storage bin extending across a discharge opening leading from said storage bin, said rotatable valve having a plurality of radially extending vanes co-operable with a stationary sealing surface located on opposite sides of said discharge opening, at least <sup>two</sup> ~~one~~ of said radially extending vanes, being in sealing engagement with ~~the~~ <sup>any instant</sup> ~~one of~~ the said stationary sealing surfaces at ~~all rotational positions of said rotatable discharge valve~~.

# COMPLETE SPECIFICATION

(ORIGINAL)

Application Number:  
Lodged:

Class

Int. Class

Complete Specification Lodged:  
Accepted:  
Published:

Priority:

Related Art:

Name of Applicant: WILLIAMES HI-TECH INTERNATIONAL PTY. LTD.

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50 QUEEN STREET, MELBOURNE, AUSTRALIA, 3000.

Complete Specification for the invention entitled:

TEA HARVESTING EQUIPMENT

The following statement is a full description of this invention, including the best method of performing it known to: US

TEA HARVESTING EQUIPMENT

The present invention relates to improvements in tea harvesting equipment.

The objective of this invention is to provide improved harvesting machinery that will efficiently cut the desired upper new growth leaves and collect same delivering them to a storage zone prior to subsequent processing steps.

Tea plantations commonly arrange tea bushes in rows which may be evenly spaced or not. Adjacent bushes in each row tend to grow into one another to form a hedge. In some plantations, shade trees are grown in certain rows in the belief that the shade provided by the canopy of these trees enhances growth in the tea bushes. The difficulty for mechanical harvesting is, however, that these shade trees obstruct passage of the harvesting equipment.

According to a first aspect of this invention, there is provided tea harvesting equipment comprising an elevated support platform frame, transportation means depending from said frame and laterally spaced to move between adjacent rows of tea bushes with said frame passing over one or more rows of tea bushes, cutting means movably supported from said frame extending across a zone below said frame between said laterally spaced transportation means, said cutting means being mounted on a movable chute for conveying cut tea leaves rearwardly to a storage bin, said movable chute engaging with a stationary passage means leading to said storage bin, and means for establishing vacuum conditions in said movable chute and said passage means for moving said cut tea leaves to said storage bin, said harvesting equipment being characterised by said cutting means comprising at least one cutter bar forming at least one complete helix mounted on a rotatable shaft, said cutter bar co-operating with a stationary cutter element mounted on said movable chute, said rotatable shaft being rotated at a speed responsive to the forward speed of said harvesting equipment. Conveniently, said cutting means includes no more than two said helically formed cutter bars

arranged to ensure a substantial air flow space between said cutter bars and into said movable chute.

According to a second aspect ~~of the present invention~~, there is provided tea harvesting equipment comprising, <sup>a frame forming</sup> an elevated support platform, transportation means depending from said frame and laterally spaced to move between adjacent rows of tea bushes, cutting means movably supported from said frame extending across a zone below said frame between said laterally spaced transportation means, said cutting means being mounted on a movable chute for conveying cut tea leaves rearwardly to a storage bin, said movable chute engaging with a stationary passage means leading to said storage bin, and means for establishing vacuum conditions in said movable chute and said passage means for moving said cut tea leaves to said storage bin, said harvesting equipment being characterised by ~~said~~ auxiliary cutter means comprising cutter elements in a normal operating position extending laterally from said frame in a manner enabling pivotal movement of said cutter elements about an upright axis located at or adjacent said frame, a rotatable buffer located at an outer free end of said cutter elements capable of rotation about an upright axis, and means for resiliently maintaining said cutter elements in said normal operating position but permitting movement therefrom under action of forces applied to said rotatable buffer.

<sup>still further</sup>  
In accordance with a ~~second~~ aspect ~~of the present invention~~, there is provided tea harvesting equipment comprising, <sup>a frame forming</sup> an elevated support platform, transportation means depending from said frame and laterally spaced to move between adjacent rows of tea bushes, cutting means movably supported from said frame extending across a zone below said frame between said laterally spaced transportation means, said cutting means being mounted on a movable chute for conveying cut tea leaves rearwardly to a storage bin, said movable chute engaging with stationary passage means leading to said storage means, and means for establishing vacuum



conditions in said movable chute and said passage means for moving said cut tea leaves to said storage bin, said harvesting equipment being characterised by said vacuum forming means being arranged to withdraw air from said bin and said movable chute and passage means to create said vacuum conditions with a higher degree of vacuum in said movable chute and passage means relative to said storage bin, and a rotatable discharge valve located in a lower region of said storage bin extending across a discharge opening leading from said storage bin, said rotatable valve having a plurality of radially extending vanes co-operable with a stationary sealing surface located on opposite sides of said discharge opening, at least one of said radially extending vanes being in sealing engagement with the said stationary sealing surfaces at all rotational positions of said rotatable discharge valve.

The present invention will be better understood from the following description of a preferred embodiment given in relation to the accompanying drawings in which :

Figure 1 is a perspective view of tea harvesting equipment according to the present invention;

Figure 2 is a view similar to Figure 1 partly broken away illustrating certain operational features;

Figure 3 is a cross-sectional view showing details of the cutter means;

Figure 3A is a detailed view of the area marked B in Figure 3; and

Figures 4A and 4B are schematic views showing an auxiliary cutter system in front elevation and plan view.

Referring to Figure 1, the apparatus comprises a platform support frame (not shown) supported on depending legs such that the support frame is maintained at an elevated stable position above tea bushes to be harvested. Suitable transportation means such as wheels or endless support tracks are mounted to the depending legs to enable the entire apparatus to move forwardly over a row of tea bushes with the transportation means passing between

adjacent rows. Conveniently, in line legs may be movably mounted on the support frame to enable the spacing between the transportation means to be varied to adapt for different spacings between adjacent rows of tea bushes. The respective legs may include a sleeve slidable on a horizontal strut of the support frame, with an actuating cylinder being provided to effect relative sliding movement. Once the desired spacing has been effected between the transportation means, suitable fixing pins are used between the sleeve and the frame strut to fix the spacing in the position selected.

At a forward end of the support frame, there is provided suitable fuel tanks, power plant, pressurised hydraulic fluid systems and operator's station. All of these are conventional in nature and have been omitted from the drawings for the sake of clarity. Located rearwardly of this equipment is the cutter means 10 which depends downwardly from the support frame. The cutter means 10 is adjustable in height by being movable downwardly or upwardly relative to the support frame. The cutter means 10 comprises a pair of cutter bars 11 forming a complete helix mounted from a rotatable drive shaft 12 by a plurality of transverse plate members 13. Each cutter bar 11 is formed by a support member 14 and a cutting plate 15 secured to the support member 14 by a plurality of fasteners 16 passing through elongated slots 17 to enable adjustment of the cutting edge. The drive shaft 12 is driven by a suitable hydraulic motor 18 which is controlled in response to the forward movement of the transport means to achieve optimum cutting of tea leaves from the bushes. If the cutter means is rotated too rapidly, the leaf is rapidly chopped and thrown forward out of the zone where it will be picked up for transport to the storage bin 19. If the speed is too low relative to the forward motion of the machine then the tea will not be cut correctly and the tea will be damaged.

The cutter means 10 is mounted at a lower end of a chute 20 adapted to form part of a conveying passage 21 to

5 said storage bin 19. The chute 20 slides within a stationary passage means 22 with seal means 23 preventing or minimising the escape of air from the conveying passage 21. At the lower end of the chute 20 there is provided a rearwardly and upwardly curved wall 24 providing a smooth transition into the vertical zone of the conveying passage 21. The lower end of the curved wall 24 includes a stationary cutter bar element 25 which co-operates with the helical cutter bars 11 of the cutter means 10. The chute 20 10 also includes rearwardly located post elements arranged adjacent the passage means 22 on either side of the support frame. The post elements are not illustrated for the sake of clarity but are controlled by roller elements on stationary support members on the support frame to ensure that the cutter means are held at any desired position. The cutter means 10 is raised or lowered by actuating means such as hydraulic cylinders, however, once set at a desired position, fixing pins are used between the post elements (associated with the cutter means) and the stationary support members to ensure the stability of the position set 15 regardless of the hydraulic actuating cylinders.

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25 The conveying passage 21 leads to an upper zone of the storage bin 19. A mesh screen 26 separates the main volume 27 of the storage bin from an upper chamber 28. A pair of turbines 29 are provided to withdraw air from the storage bin and thereby from the conveying passage 21. Because the volume within the zones 27,28 is much higher than in the passage 21, the vacuum conditions within the passage 21 is much higher than in the bin 19. As a result, cut leaf is picked up and conveyed through the passage 21 to the bin 19. In the bin 19, the cut leaf tends to drop out of the air stream and fall out into the bottom of the bin 19. Moreover, the screen 26 prevents the escape of leaf 30 from the bin 19.

35 Located in the base of the storage bin there is provided a rotary discharge valve 30. The discharge valve 30 comprises a rotary member 31 having a plurality of radial

vanes 32 having seals at their outer edges. The seals of the vanes 32 co-operate with curved sealing surfaces 33 located on either side of a discharge opening 34 leading from a base region of the bin 19. The arrangement is such to ensure that a seal of a respective vane 32 is always in ~~one surface 33 while a seal of a second vane 32 is in contact with the other 33.~~ contact with ~~each of the surfaces 33.~~ In this manner, vacuum conditions are maintained within the bin 19 while still enabling discharge of cut tea leaf through the discharge opening 34.

As is best seen in Figure 1, immediately below the discharge opening 34, a suitable tea leaf bagging system is provided. The arrangement comprises a rectangular framework 35 defining adjacent pairs of openings in the longitudinal direction with a plurality of such bagging locations arranged across the machine. The framework is supported by rollers 36 located on roller guides 37 on either side of the machine. Thus, while one line of bags supported by the framework 35 are filled from the rotary discharge valve 30, a second line of empty bags are positioned in the adjacent openings ready to be filled upon moving the framework 35 in the longitudinal direction. Once this is done the filled bags are removed and new empty bags positioned ready to be filled. In an alternative arrangement, the framework 35 might be replaced by an open top and bottom box that is movable longitudinally to be filled from the discharge opening 34. Once the box is filled it can then be moved longitudinally to allow the cut tea to be dropped from the machine support platform into a transport trailer or the like.

Reference is now made to Figures 4A and 4B showing an auxiliary cutter means. The arrangement comprises a laterally extending auxiliary cutter bar 60 similar to the main cutter means 10. The cutter bar 60 is pivoted for movement about a substantially vertical pivot axis 61 in a manner enabling adjustment in height of the auxiliary cutter means 60 with the main cutter means 10 as aforesaid. The outer free end of the cutter bar 60 has a rotatable buffer



62 also mounted for rotation about a generally upright pivot axis 63. The cutter bar 60 may form a co-extension of the main cutter means 10 or it may overlap the main cutter means 10 to ensure there is <sup>no</sup> lateral zone not subject to a cutting action. A suitable resilient means is provided to maintain the cutter bar 60 in the position indicated but allowing rotation of the cutter bar 60 about the axis 61 when the buffer 62 engages an immovable object such as the trunk of a shade tree. In this manner the auxiliary cutter means may be arranged to cut tea bushes planted in line with shade trees. The buffer 62 engages the trees and moves around the trees while continuing to allow the cutter bar 60 to cut the tea bushes.

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THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Tea harvesting apparatus comprising an elevated support platform frame, transportation means depending from said frame and laterally spaced to move between adjacent rows of tea bushes with said frame passing over one or more rows of tea bushes, cutting means movably supported from said frame extending across a zone below said frame between said laterally spaced transportation means, said cutting means being mounted on a movable chute for conveying cut tea leaves rearwardly to a storage bin, said movable chute engaging with a stationary passage means leading to said storage bin, and means for establishing vacuum conditions in said movable chute and said passage means for moving said cut tea leaves to said storage bin, said harvesting equipment being characterised by said cutting means comprising at least one cutter bar forming at least one complete helix mounted on a rotatable shaft, said cutter bar co-operating with a stationary cutter element mounted on said movable chute, said rotatable shaft being rotated at a speed responsive to the forward speed of said harvesting equipment.

2. Tea harvesting apparatus according to Claim 1, wherein said cutting means includes no more than two said helically formed cutter bars arranged to ensure a substantial air flow space between said cutter bars and into said movable chute.

3. Tea harvesting apparatus according to Claim 2, wherein the or each said cutter bar includes a cutting plate forming a cutting edge, <sup>adjustably</sup> ~~movably~~ mounted on a support bar.

4. Tea harvesting apparatus according to any one of Claims 1 to 3, wherein the movable chute telescopically engages with said stationary passage means.



5. Tea harvesting apparatus according to any one of Claims 1 to 4, further including auxiliary cutter means comprising cutter elements, in a normal position, extending laterally from said frame in a manner enabling pivotal movement of said cutter elements about an upright axis located at or adjacent said frame, a rotatable buffer located at an outer free end of said cutter elements capable of rotation about an upright axis, and means for resiliently holding the cutter elements in said normal operating position but permitting movement therefrom under action of forces applied to said rotatable buffer.

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6. Tea harvesting apparatus according to any one of Claims 1 to 5, wherein said vacuum forming means is arranged to withdraw air from said bin and said movable chute and said passage means ~~to create said vacuum conditions with a higher degree of vacuum in said movable chute and passage means relative to said storage bin~~, and a rotatable discharge valve located in a lower region of said storage bin extending across a discharge opening leading from said storage bin, said rotatable valve having a plurality of radially extending vanes co-operable with a stationary sealing surface located on opposite sides of said discharge opening, at least <sup>two</sup> ~~one~~ of said radially extending vanes, <sup>each</sup> being in sealing engagement with the said stationary sealing surfaces at <sup>any instant</sup> ~~all rotational positions of said rotatable discharge valve~~.

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7. Tea harvesting apparatus comprising, an elevated support platform, transportation means depending from said frame and laterally spaced to move between adjacent rows of tea bushes, cutting means movably supported from said frame extending across a zone below said frame between said laterally spaced transportation means, said cutting means being mounted on a movable chute for conveying cut tea leaves rearwardly to a storage bin, said movable chute engaging with a stationary passage means leading to said



storage bin, and means for establishing vacuum conditions in said movable chute and said passage means for moving said cut tea leaves to said storage bin, said harvesting equipment being characterised by ~~said~~ auxiliary cutter means comprising cutter elements in a normal operating position extending laterally from said frame in a manner enabling pivotal movement of said cutter elements about an upright axis located at or adjacent said frame, a rotatable buffer located at an outer free end of said cutter elements capable of rotation about an upright axis, and means for resiliently maintaining said cutter elements in said normal operating position but permitting movement therefrom under action of forces applied to said rotatable buffer.

8. Tea harvesting apparatus comprising an elevated support platform, transportation means depending from said frame and laterally spaced to move between adjacent rows of tea bushes, cutting means movably supported from said frame extending across a zone below said frame between said laterally spaced transportation means, said cutting means being mounted on a movable chute for conveying cut tea leaves rearwardly to a storage bin, said movable chute engaging with stationary passage means leading to said storage means, and means for establishing vacuum conditions in said movable chute and said passage means for moving said cut tea leaves to said storage bin, said harvesting equipment being characterised by said vacuum forming means being arranged to withdraw air from said bin and said movable chute and passage means ~~to create said vacuum conditions with a higher degree of vacuum in said movable chute and passage means relative to said storage bin~~, and a rotatable discharge valve located in a lower region of said storage bin extending across a discharge opening leading from said storage bin, said rotatable valve having a plurality of radially extending vanes co-operable with a stationary sealing surface located on opposite sides of said discharge opening, at least <sup>two</sup> ~~one~~ of said radially extending



each - 12 - a respective one of  
vanes, being in sealing engagement with, the said stationary  
sealing surfaces at <sup>any instant</sup> ~~all rotational positions of said~~  
~~rotatable discharge valve.~~

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DATED THIS 14th day of April, 1989

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SKP:JC (10.14)



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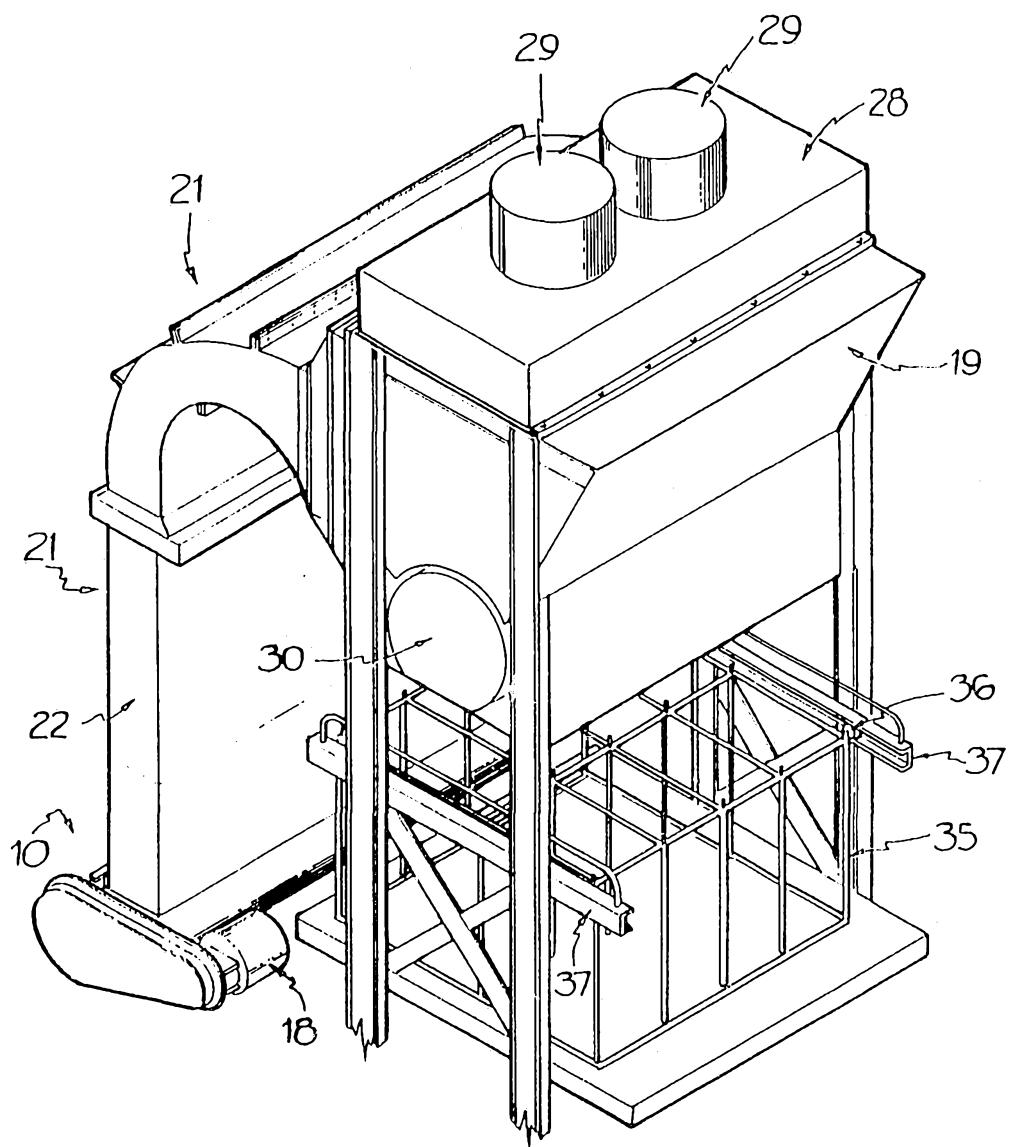
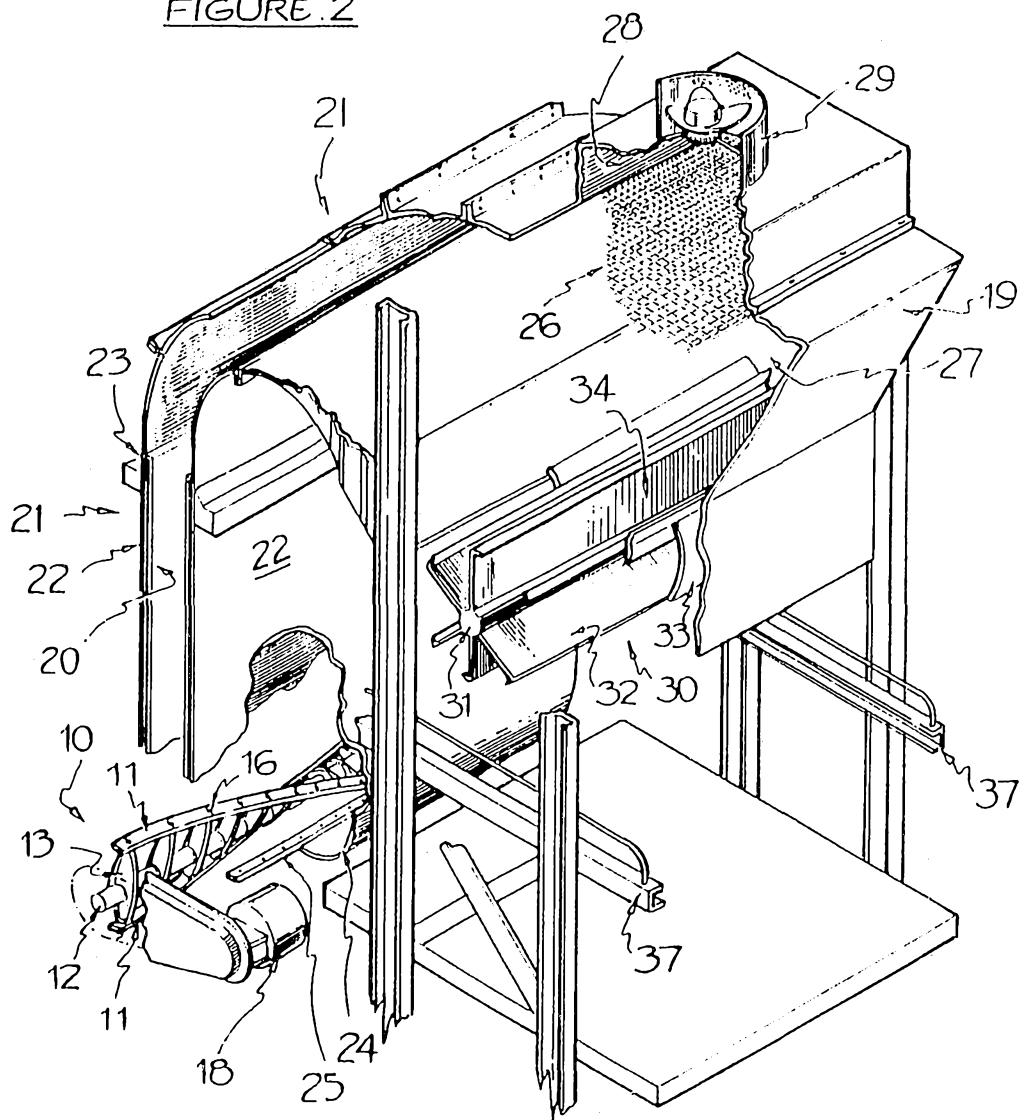


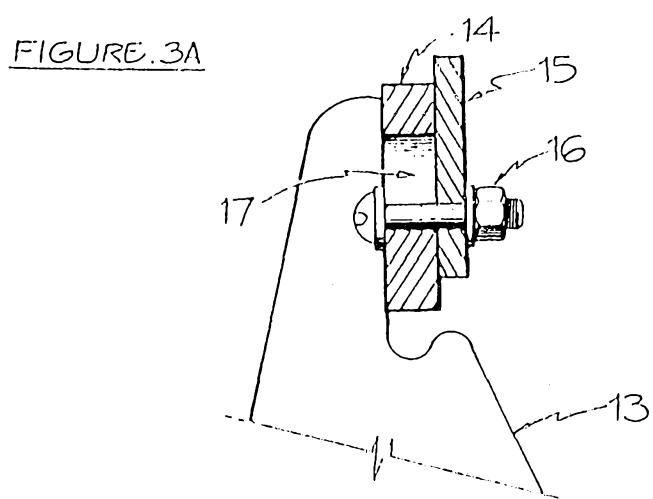
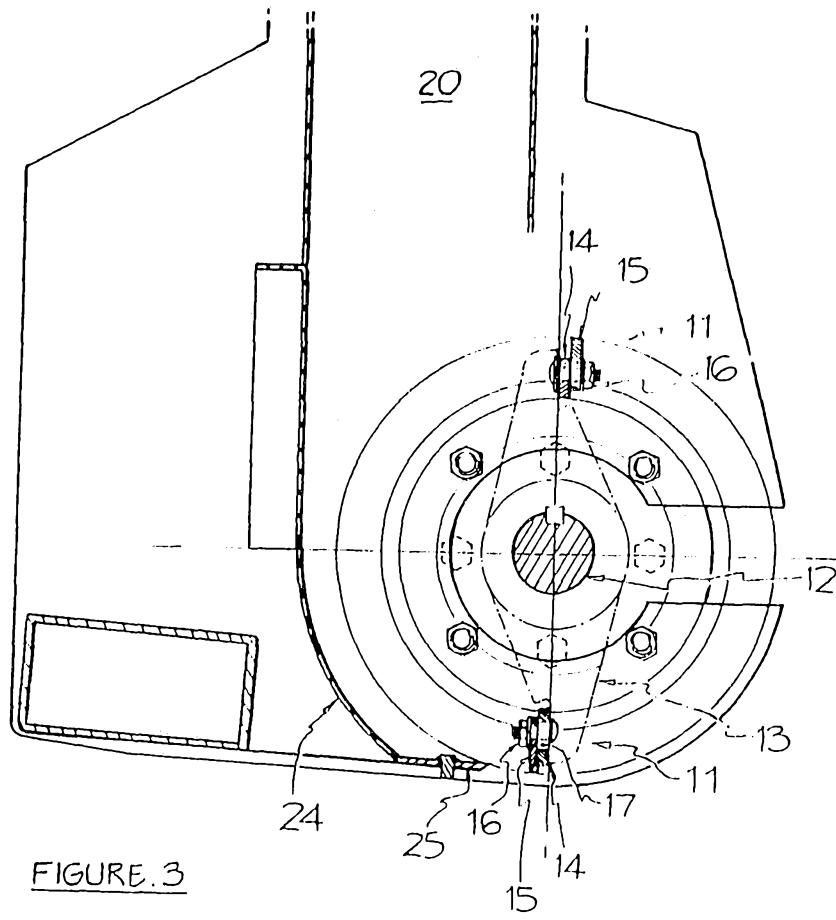
FIGURE.1

33097/89

FIGURE 2



33097/89



33097/89

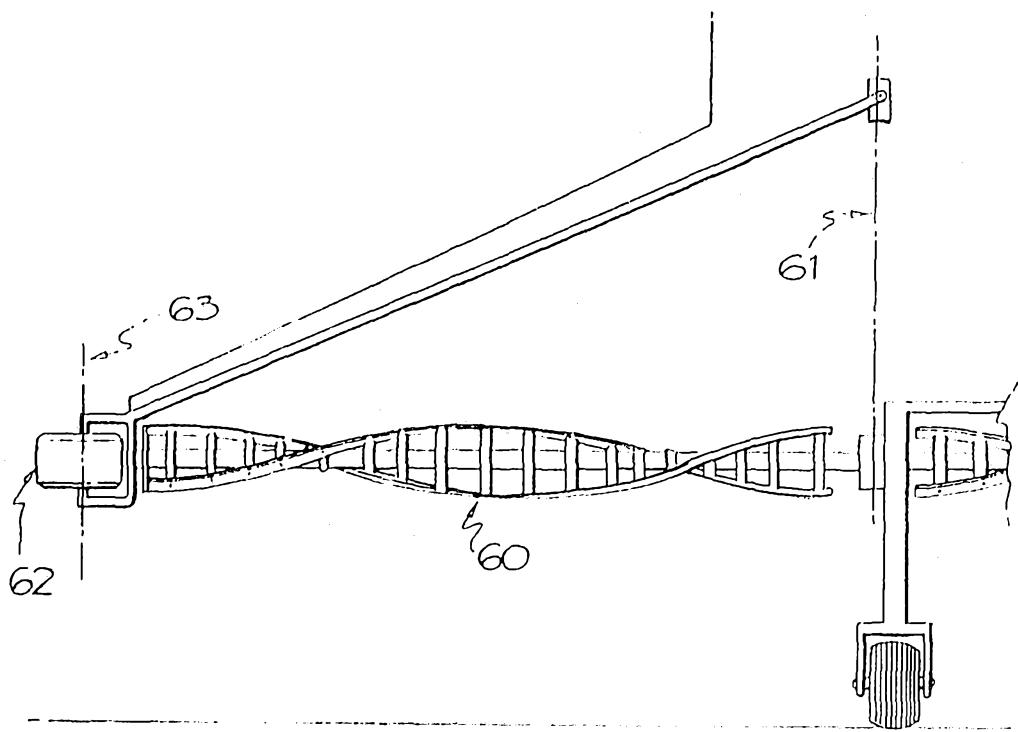


FIGURE 4A

FIGURE 4B

