

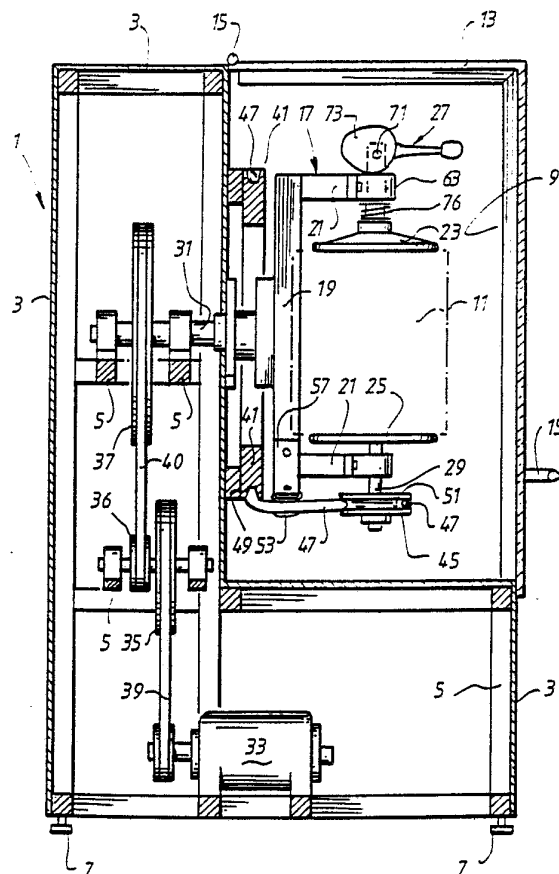


## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<b>(51) International Patent Classification <sup>5</sup> :</b> <b>B01F 9/00, 9/02, 9/10</b> <b>B44D 3/06</b>	<b>A1</b>	<b>(11) International Publication Number:</b> <b>WO 91/08045</b> <b>(43) International Publication Date:</b> 13 June 1991 (13.06.91)
<b>(21) International Application Number:</b> PCT/AU90/00574 <b>(22) International Filing Date:</b> 29 November 1990 (29.11.90) <b>(30) Priority data:</b> PJ 7617 29 November 1989 (29.11.89) AU <b>(71) Applicant (for all designated States except US):</b> GEORGE FETHERS & CO. TRADING PTY. LTD. [AU/AU]; 216 Rouse Street, Port Melbourne, VIC 3207 (AU). <b>(72) Inventor; and</b> <b>(75) Inventor/Applicant (for US only) :</b> CHIVERS, Peter, A. [AU/AU]; 9 Beresford Close, Doncaster, VIC 3108 (AU). <b>(74) Agent:</b> BRETT, Noel, Thomas; Griffith Hack & Co., 601 St. Kilda Road, Melbourne, VIC 3004 (AU).		<b>(81) Designated States:</b> AT (European patent), AU, BE (European patent), CA, CH (European patent), DE (European patent), DK (European patent), ES (European patent), FR (European patent), GB (European patent), GR (European patent), IT (European patent), JP, LU (European patent), NL (European patent), SE (European patent), US.  <b>Published</b> <i>With international search report.</i>

**(54) Title:** MIXING APPARATUS**(57) Abstract**

A mixing apparatus is disclosed for mixing materials within a chamber (11). The chamber (11) may be a can of paint. The apparatus has holding means (17) which can clampingly engage with the chamber (11). The holding means (17) is mounted to rotate about a first axis on axle (31). A first wheel (41) is fixedly mounted about axle (31) so that it cannot rotate. Drive means in the form of a belt (47) passes over the first wheel (41) and over a second wheel (45). As the holding means (17) is rotated, the belt (47) imparts drive to the second wheel (45). The chamber (11) is therefore rotated about a first axis and simultaneously about a second axis generally orthogonal to the first axis.



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MIXING APPARATUS

5                   Field of the Invention

This invention relates to mixing apparatus for mixing materials within a chamber and relates particularly, but not exclusively, to apparatus for mixing paint.

Description of Prior Art

10           Hitherto, in the art of mixing paint it has been proposed to provide apparatus which will rotate a can of paint simultaneously about two axes of rotation which are generally orthogonal to each other. In such known apparatus independent

drive means are provided for rotating the can of paint about each axis. The independent drive means results in complicated mechanical constructions and increases costs unnecessarily.

Object and Statement of Prior Art

5 It is an object of the present invention to provide an improved mixing apparatus.

Therefore, in accordance with a first aspect of the present invention there is provided apparatus for mixing materials within a chamber, said apparatus comprising holding  
10 means for holding a chamber containing the materials to be mixed, said holding means mounted for rotation about a first axis and for simultaneous rotation about a second axis generally orthogonal to said first axis, whereby said chamber will be simultaneously rotated about said first axis and said  
15 second axis to effect such mixing, said apparatus comprising drive means for rotating said holding means about said first axis and said second axis, said drive means including a non-rotatable first wheel means drive connected with second wheel means which can rotate about said second axis, said  
20 second wheel means being connected with said holding means so that when said holding means is rotated about said first axis and said chamber is then also rotated about said first axis, said second wheel means will be rotated by said drive connection with said first wheel means to, in turn, effect  
25 rotation of said holding means simultaneously about said second axis.

Most preferably said drive connection is a belt or like transmission which passes over the circumferential surface of said first wheel means and is lifted off said  
30 circumferential surface by transfer roller means as said holding means rotates relative to said first wheel means. The belt or like transmission then passes onto the circumferential surface of said second wheel means to effect a drive to said second wheel means.

Thus, as the first wheel means is held stationary and said holding means is rotated about said second axis - the central axis of said first wheel means - the belt or like transmission will, impart drive to said second wheel means to  
5 cause it to rotate about said first axis - the central axis of said second wheel means.

#### Brief Description of Drawings

In order that the invention can be more clearly ascertained, an example of a preferred embodiment for mixing  
10 paint will now be described with reference to the accompanying drawings, wherein:

Figure 1 is a side cross-sectional view of the apparatus. The sectional view is taken at one extreme side edge of a cabinet of the apparatus;

15 Figure 2 is a rear view of the apparatus shown in Figure 1 with the rear wall of the cabinet removed;

Figure 3 is a front view of the apparatus shown in Figures 1 and 2;

Figure 4 is a close-up side view showing detail of  
20 part of holding means used for holding a paint can within the apparatus; and

Figure 5 is an underneath view showing in detail of transfer roller means which permits a belt transmission to be lifted off a first wheel means and onto a second wheel means.

#### 25 Detailed Description of Preferred Embodiments

Referring now to Figures 1, 2 and 3, there is shown views of the paint mixing apparatus. The apparatus 1 has a generally rectangular shaped cabinet 3 made from sheet steel. The sheets comprising the cabinet 3 are fastened to a frame 5  
30 of angled steel. Levelling feet 7 are provided at the bottom of the apparatus 1. The apparatus has a front cavity 9 in which a chamber 11 can be received and held for mixing purposes. The chamber 11 is conveniently a can of paint. The cavity 9 is closed by a generally L-shaped swing-up door 13.  
35 The door 13 can be made of any suitable materials such as clear plastics material. The door hinges about hinge 15 (see

Figure 1). The door 13 may have a front lowermost handle 15 to permit easy opening and closing. The chamber 11 is held within the cavity 9 by holding means shown generally by numeral 17. The holding means 17 comprises a frame 19 of 5 rectangular configuration. The frame 19 includes two forwardly projecting arms. The uppermost arm 21 carries a first clamping pad 23 and the lowermost arm 21 includes a second clamping pad 25. The clamping pads 23 and 25 are arranged to clamp the chamber 11 - the can of paint - between . 10 its top and bottom surfaces. The first clamping pad 23 is mounted to a quick release clamping mechanism 27 which will be referred to in due course. Operating of the quick release clamping mechanism causes the first clamping pad 23 to move towards and away from the upper arm 21 (see Figure 1). The 15 first clamping pad 23 is mounted to the quick release clamping mechanism 27 so that it can rotate about its central axis. The lowermost or second clamping pad 25 is mounted to an axle 29 which, in turn, is mounted for axial rotation within a bearing (not clearly shown) at the free end of the lowermost 20 arm 21. The central axes of the first clamping pad 21 and the second clamping pad 25 are axially in line. Thus, when a chamber 11 - a can of paint - is mounted in the holding means 17 it can rotate about the central axes of each of the first clamping pad 23 and second clamping 25.

25 The holding means 17 is, in turn, mounted on an axle 31 which is mounted within bearings (not clearly shown) which are fastened to the frame 5 to rotate about the central longitudinal axis of axle 31. Thus, the holding means is able to rotate about two axes - the central longitudinal axis of 30 first clamping pad 23 and second clamping pad 25, and the central longitudinal axis of axle 31. Both axes are generally orthogonal to each other, i.e. generally perpendicular.

A motor means 33 which may conveniently comprise an electric motor, is mounted to the frame 5 and drives a series 35 of pulleys 35, 36 and 37 through belt transmission means 39

and 41. Such drive causes the holding means 17 to rotate about the central longitudinal axis of axle 31 thereby rotating the chamber 11 end for end.

The chamber 11 is caused to rotate about its central axis or approximately its central axis by means of the rotation of the holding means 17 about the central longitudinal axis of axle 31. This rotation occurs as a result of providing a non-rotatable first wheel means 41 which is held relative to the frame 5. The first wheel means 41 has its central axis in line with the central longitudinal axis of axle 31. Suitable bolts 43 are provided to hold the non-rotatable first wheel means 41 to the frame 5. The lowermost end of axle 29 (see Figure 1) of the second clamping pad 25 carries a second wheel means 45. The second wheel means 45 is drive connected with the first wheel means 41 so that when the holding means 17 is rotated, drive will be imparted to the second wheel means 45 to cause the second clamping 25 to rotate about its central axis - about the central axis of axle 29. Because the chamber 11 is clamped between the second clamping pad 25 and the first clamping pad 23, it will then be caused to rotate about its central axis or approximately its central axis. This will depend on whether the chamber 11 - the paint tin - is mounted centrally so that its central longitudinal axis aligns with the central longitudinal axis of axle 29. Exact coincidence of these two axes is not particularly important as long as there is approximate alignment, that will be satisfactory. The drive between the first wheel means 41 and the second wheel means 45 is conveniently a belt 47 or like transmission means. This is clearly shown in Figure 1. Here it can be seen that the first wheel means 41 contains a belt groove 49 around its circumferential surface. The belt 47 locates within the belt groove 49 and passes over the outer circumferential surface and around the second wheel means 45 in a belt groove 51 therein. Detail of the construction is clearly shown in Figure 5. The belt 47 is assisted in transferring off the

first wheel means 41 and onto the circumferential surface of the second wheel means 45 by means of a pair of transfer roller means 53. The transfer roller means 53 are journaled onto axles 55 which, in turn, are held on brackets 57 which are, in turn, fastened to the holding means 17 on its frame 19. The angle of inclination of the transfer roller means 53 is chosen to enable suitable lifting off of the belt 47 and return of the belt 47 to the groove 49 of the first wheel means 41 and so the belt 47 passes around the circumferential surface of the second wheel means 45. Thus, as the holding means 17 is rotated about the central longitudinal axis of axle 31, the belt 49 will, in part, drive to the second wheel means 45 from the first wheel means 41 to cause the chamber 11 to rotate generally about its central longitudinal axis.

It can therefore be seen that the apparatus provides a simple drive means to effect rotation of the chamber 11 about two axes which are orthogonal to each other.

The belts 39 and 41 from the motor 33 may be mounted on swinging means 59 so that the belts can be suitable tensioned. Thus, belt tensioning means may be provided.

Referring now to Figure 4 there is shown close-up detail of the quick release clamping mechanism 27. Figure 4 should be considered in conjunction with Figure 3. In Figure 4 the clamping pad 23 is shown in an elevated position - a non-chamber 11 clamping position - whilst in Figure 3 it is shown in a clamping position. Figure 4 is a transverse cross-sectional view taken along section line 4-4 of Figure 3.

The first clamping pad 23 is mounted to a central axle 61 so that it can rotate about its central longitudinal axis without rotation of the axle 61. The axle 61 is, in turn, mounted within a sleeve 63 attached to the free end of the frame 19 of the holding means 17. The axle 61 is able to move upwardly and/or downwardly relative to the sleeve 63 when viewing Figure 4. The axle 61 is not able to rotate relative to the sleeve 63 but the first clamping pad 23 can rotate relative to the axle 61. The uppermost end of axle 61 is



machined with two opposed flat surfaces 65. A handle 67 with a pair of forwardly extending flanges 69 is fitted about the free end of the axle 61 so the inside faces of the flanges 69 are engaged with the machined flat surfaces 65. A pin 71 holds the handle 67 to the axle 61 so that the handle 67 can swing relative to the axle 61. The pin 71 has two cams 73 fixed thereto. The cams are mounted on the outermost sides of the flanges 69. Thus, swinging of the handle 67 will cause the cams 73 to rotate about the central longitudinal axis of pins 71. As shown in Figure 4, the outermost cam surfaces of cam 73 engage with the upper surface 75 of the sleeve 63 and cause the axle 61 to move upwardly or downwardly within the sleeve 63. Spring means 75 comprising a compression spring is mounted over the lowermost end of axle 61 between the first clamping pad and the undersurface 77 of the sleeve 63.

In order to effect clamping of the chamber 11 within the holding means 17, the arm 67 is swung downwardly in the direction of the arrow shown in Figure 4. This causes the radial distance of the cam surface of cam 73 to decrease relative to the central longitudinal axis of pin 71 which, in turn, will allow the axle 61 to move downwardly within a sleeve 63. The spring means 75 will, in turn, ensure that a constant pressure is applied between the cam surfaces of cam 73 and the upper surface 75 of the sleeve 63. It will also provide sufficient force to clampingly hold the chamber 11 - the can of paint - between the first clamping pad 23 and the second clamping pad 25. Thus, the clamping of the chamber 11 is effected by the spring pressure applied by the spring means 75 and not by the action of the pressure exerted by the cam 73. To release the chamber 11 from the clamping pads 23 and 25, the arm 67 is swung in an upward direction thereby causing the first clamping pad 23 to move upwardly to lift the first clamping pad 23 off the upper surface of the chamber 11.

Modifications may be made to the present invention as would be apparent to persons skilled in the art of manufacturing apparatus of this type. For example, it would

be possible to effect a drive between the first wheel means 41 and the second wheel means 45 by means other than a belt drive. For example, roller means could be provided which engage with the circumferential surface region of the first wheel means 41 and, in turn, transfer drive to the surface of the second wheel means 45. Further, by appropriate design, it may be possible to connect the second wheel means to directly drive on a circumferential surface region of the first wheel means 41. Conveniently this may be by means of a friction drive from a suitable surface of the second wheel means 35 to a suitable surface of the first wheel means 41. Conveniently these surfaces may be rubber surface coated to permit non-slip drive. In addition a chain may be used rather than the belt 47. In addition gears may be provided so that, for example, the first wheel means 41 may have gear teeth whilst the second wheel means 45 may have corresponding gear teeth which meshingly engage with the teeth on the first wheel means 41. The construction disclosed in relation to the example described herein is considered the most economically preferable construction.

The door 13 may be provided with an electrical interlock so that the motor 33 cannot be activated until the door 13 is closed.

These and other modifications may be made without departing from the ambit of the invention, the nature of which is to be determined from the foregoing description.

CLAIMS:

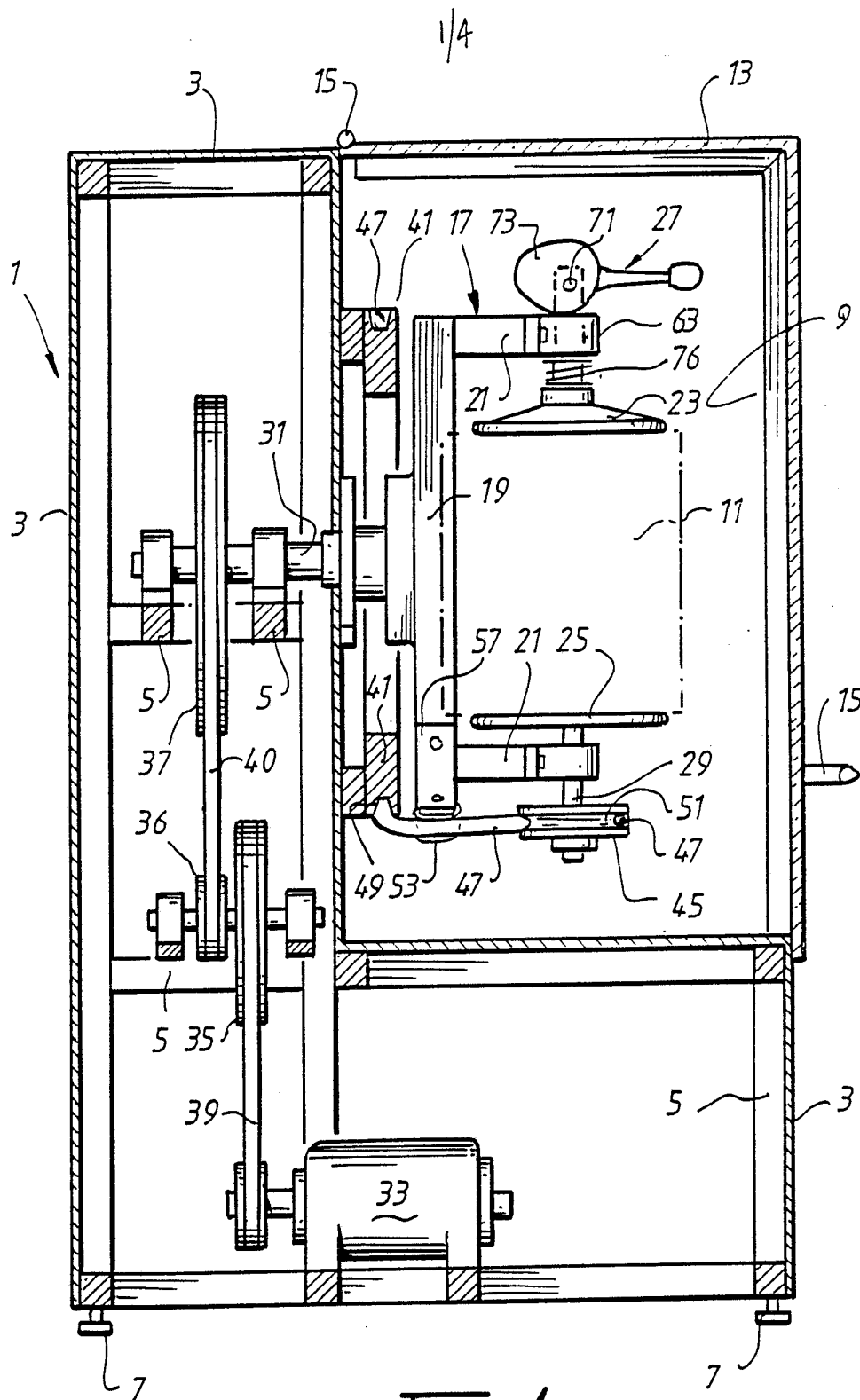
1. Apparatus for mixing materials within a chamber, said apparatus comprising holding means for holding a chamber containing the materials to be mixed, said holding means mounted for rotation about a first axis and for simultaneous rotation about a second axis generally orthogonal to said first axis, whereby said chamber will be simultaneously rotated about said first axis and said second axis to effect such mixing, said apparatus comprising drive means for rotating said holding means about said first axis and said second axis, said drive means including a non-rotatable first wheel means drive connected with second wheel means which can rotate about said second axis, said second wheel means being connected with said holding means so that when said holding means is rotated about said first axis and said chamber is then also rotated about said first axis, said second wheel means will be rotated by said drive connection with said first wheel means to, in turn, effect rotation of said holding means simultaneously about said second axis.
2. Apparatus as claimed in claim 1 wherein said drive connection is a belt or like transmission which passes over a circumferential surface of said first wheel means and is lifted off said circumferential surface by transfer roller means as said holding means rotates relative to said first wheel means.
3. Apparatus as claimed in claim 2 wherein said belt or like transmission then passes onto a circumferential surface of said second wheel means to effect a drive to said second wheel means.
4. Apparatus as claimed in claim 1 wherein said holding means comprises a frame which carries a first clamping pad and a second clamping pad for engaging with respective end surfaces of said chamber and for clamping said chamber to said holding means.

5. Apparatus as claimed in claim 4 wherein said first clamping pad has a quick release clamping mechanism for permitting quick release clamping of said chamber to said holding means.

6. Apparatus as claimed in claim 4 wherein said first clamping pad and said second clamping pad are mounted to said frame of said holding means axially in line and so both can rotate about a common axis, said common axis corresponding to said second axis.

7. Apparatus as claimed in claim 4 when dependent on claim 2 wherein said transfer roller means is mounted to said frame and rotates with said frame about said first axis.

8. Apparatus as claimed in claim 7 wherein said transfer roller means as mounted to said frame to rotate about its own axis as said transfer roller means is rotated with said frame about said first axis.



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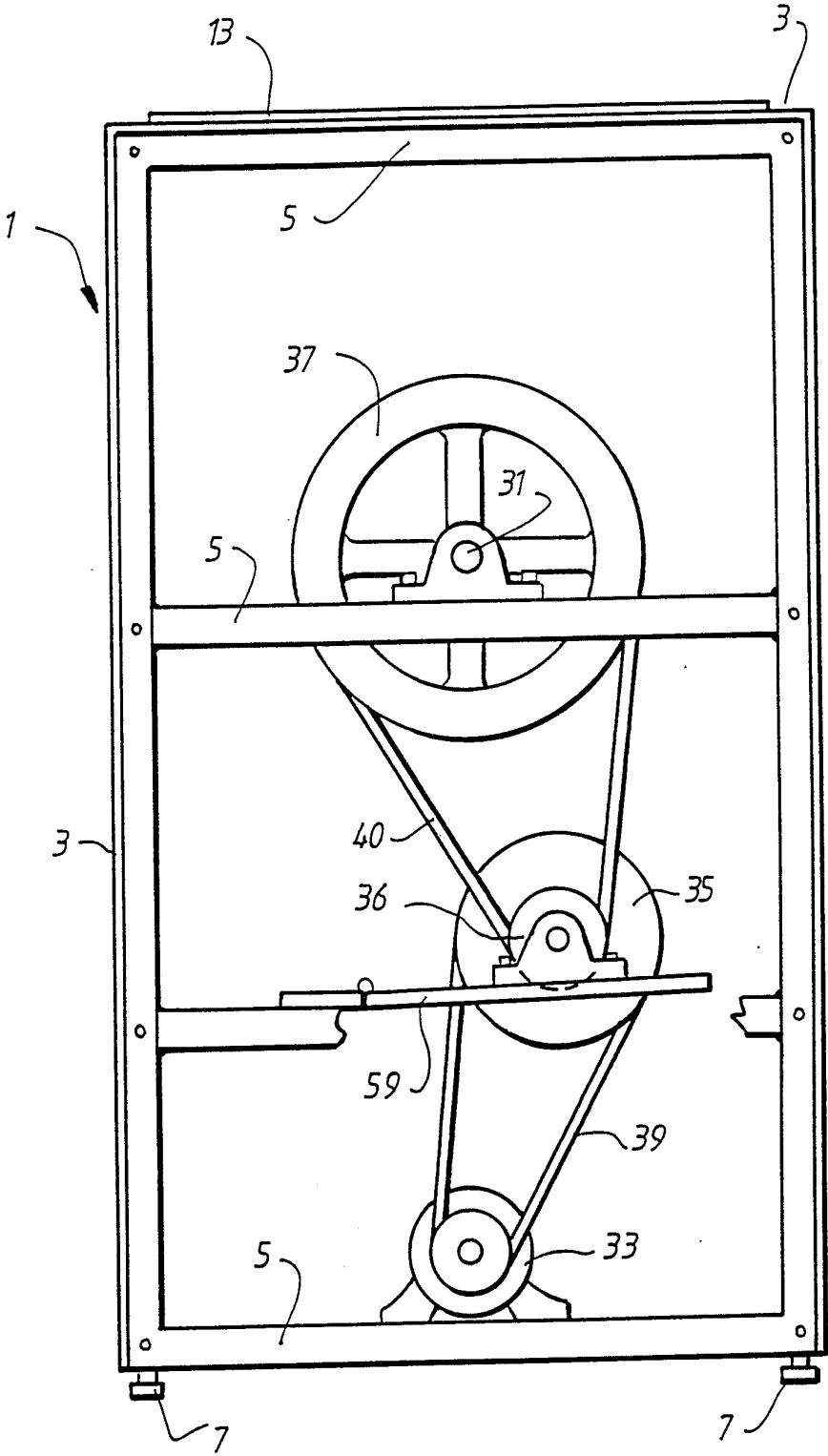
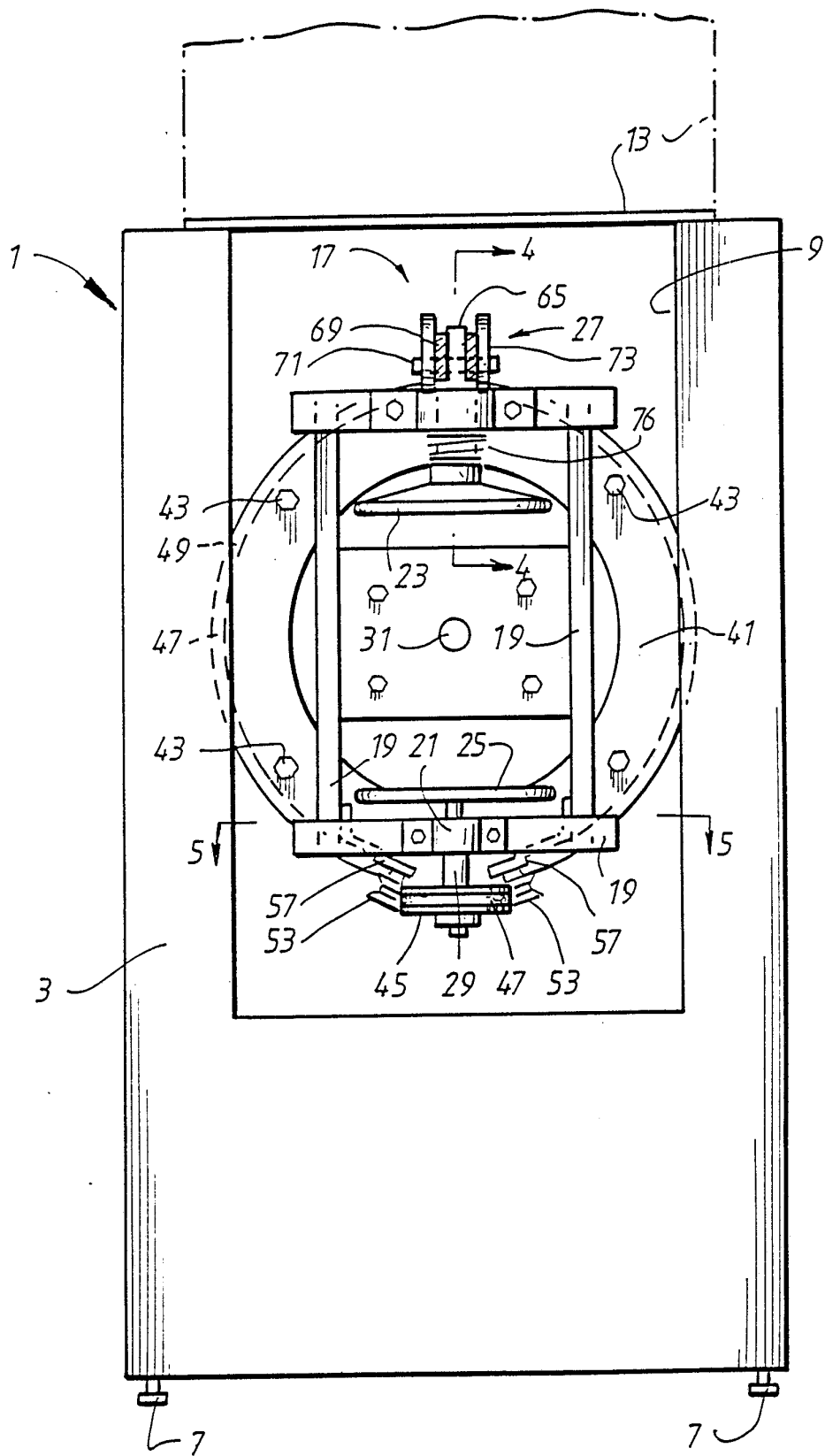


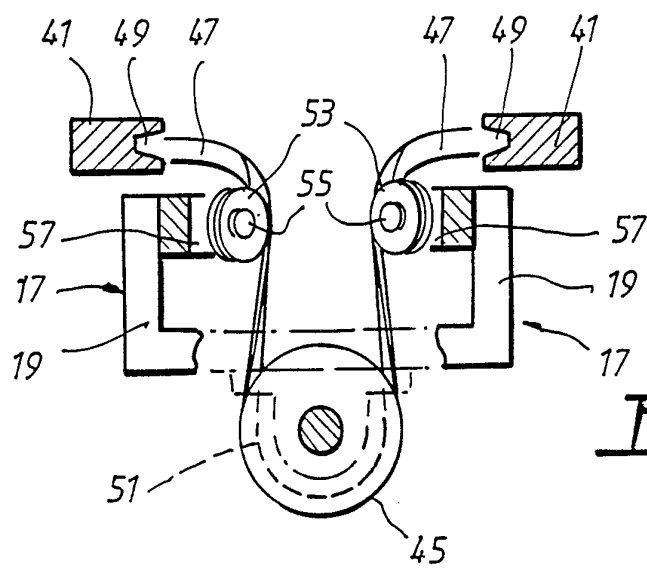
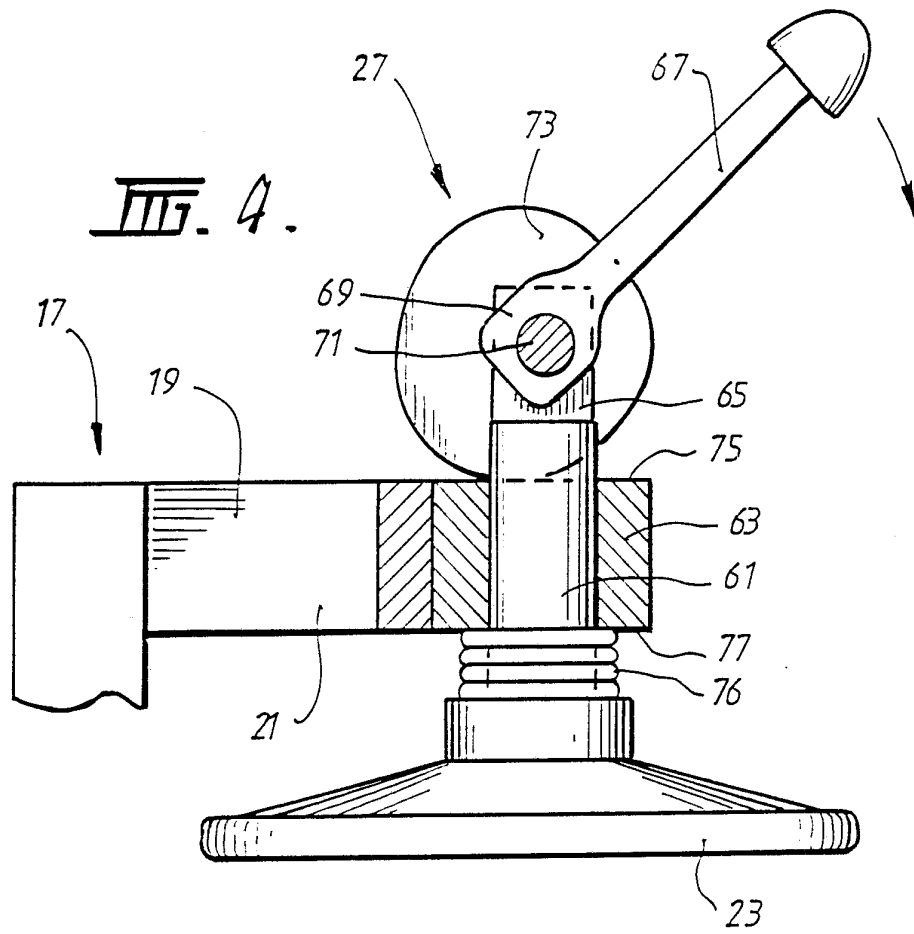
FIG. 2.

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III. 3.

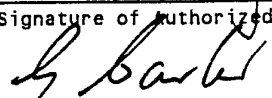
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# INTERNATIONAL SEARCH REPORT

International Application No. **PCT/AU 90/00574**

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) 6				
According to International Patent Classification (IPC) or to both National Classification and IPC				
Int. Cl. <sup>5</sup> B01F 9/00, 9/02, 9/10, B44D 3/06				
<b>II. FIELDS SEARCHED</b>				
Minimum Documentation Searched 7				
Classification System	Classification Symbols			
IPC	B01F 9/00, 9/02, 9/10, B44D 3/06			
Documentation Searched other than Minimum Documentation to the extent that such Documents are Included in the Fields Searched 8				
AU : IPC as above				
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT</b> 9				
Category*	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages 12	Relevant to Claim No 13		
X	US,A, 3880408 (KARJALAINEN) 29 April 1975 (29.04.75) See column 2 lines 36-54	(1-8)		
X	FR,A, 1189917 (BECHARD) 8 October 1959 (08.10.59) See page 2 lines 4-22	(1)		
X	FR,A, 980457 (SOCIETE POUR LE TRAITEMENT INTERNE DES CHAUDIERES) 15 May 1951 (15.05.51)	(1-3)		
A	WO 8908495 (ZIMMERMANN) 21 September 1989 (21.09.89)			
A	US,A, 1913979 (FARRINGTON) 13 June 1933 (13.06.33)			
X	US,A, 1594516 (DEROSHA) 3 August 1926 (03.08.26)	(1)		
<p>* Special categories of cited documents: 10</p> <table style="width: 100%;"> <tr> <td style="width: 50%;"> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </td> <td style="width: 50%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p> </td> </tr> </table>			<p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p>	<p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&amp;" document member of the same patent family</p>
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<b>IV. CERTIFICATION</b>				
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report			
15 February 1991 (15.02.91)	27 February 1991			
International Searching Authority	Signature of Authorized Officer			
Australian Patent Office	 G. CARTER			

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON  
INTERNATIONAL APPLICATION NO. PCT/AU 90/00574

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report		Patent Family Members			
US 3880408	AU 71348/74	BE 813161	CA 983917		
	CH 569510	DE 2415411	DK 4221/74		
	FI 49000	FR 2240042	GB 1446151		
	IT 1009441	JP 50038856	NL 7403778		
	NO 742791	SE 7409876	ZA 7404847		
WO 8908495	AU 31953/89	DE 3807658	EP 398992		

END OF ANNEX