



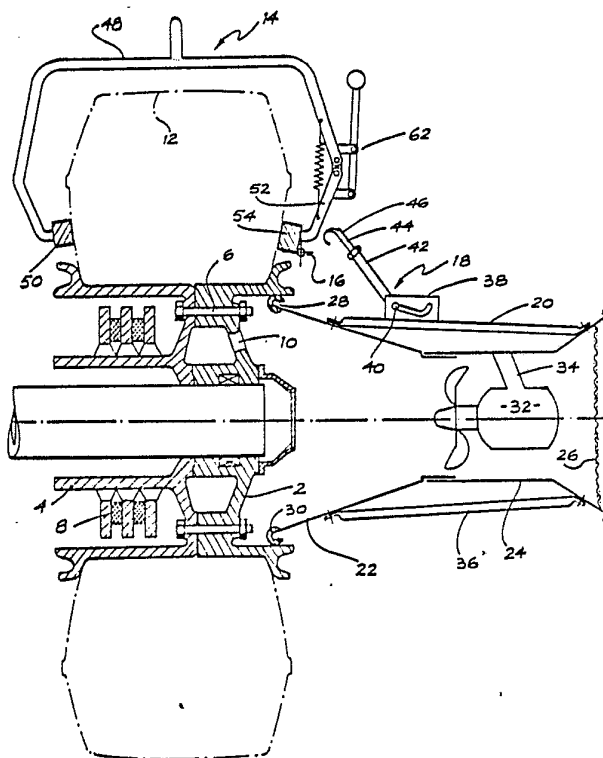
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(21) International Application Number: PCT/AU81/00058 (22) International Filing Date: 13 May 1981 (13.05.81) (71)(72) Applicant and Inventor: MERLE, Julius [AU/AU]; 2 Fabry Street, Botany, N.S.W. 2018 (AU). (74) Agent: SIELY, James, Gordon; Arthur S. Cave & Co., 1 Alfred Street, Sydney, N.S.W. 2000 (AU). (81) Designated States: DE, FR (European patent), GB, JP, US. Published With international search report.</p>		

(54) Title: WHEEL BRAKE COOLING APPARATUS FOR AIRCRAFT

(57) Abstract

A wheel brake cooling apparatus for aircraft comprises a clamp assembly (14) for attachment to an aircraft tyre (12), a duct (22) with a seal (30) which mates with the wheel hub (2) and contains an axial flow fan (32), the duct being suspended from clamp assembly by a hooked assembly (18) fixed to struts (36) which brace the duct. When activated, the fan draws air through the wheel brakes and wheel hub preventing tyre damage after high energy stops.



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WHEEL BRAKE COOLING APPARATUS FOR AIRCRAFTBACKGROUND OF THE INVENTION

This invention concerns an aircraft wheel brake cooling apparatus.

When large aircraft make high energy stops that is they use perhaps reverse thrust and maximum application of the wheel brakes the latter heat up considerably and due to the mass of the brake assembly and associated wheel and the good conductivity to the aircraft tyre there follows when the aircraft is at rest a dangerous increase in tyre pressure which must be relieved. Deflation of the tyres is hazardous because of the possibility that the two bolted halves of the wheel may burst apart while deflation is being attempted. The brakes may not cool to ambient for two hours.

If the aircraft is scheduled to take off shortly after landing which is common on short routes the brakes will be subject to a further application before cooling adequately from the high energy stop.

OBJECTIVE AND SUMMARY OF THE INVENTION

This invention seeks to provide an apparatus which reduces the risk of damage to the wheel and tyre by overheating during the period following a high energy stop.

This invention provides a wheel brake cooling apparatus for aircraft comprising a clamp assembly for attachment to an aircraft tyre, a duct adapted to be clamped by the clamp assembly against an aircraft wheel upon which the tyre is fitted,

and a fan arranged, when activated, to draw cooling air through the wheel brake assembly via the duct.

A clamp assembly may comprise a tyre-straddling, U-shaped frame with a first tyre engaging pad for one sidewall of the wheel and a second tyre engaging pad for the opposite side wall and means to clamp the pads against the tyre. The frame may be made of a major part, the length of which exceeds the greatest sidewall to sidewall width of the tyre, which part carries an inwardly directed pad for engaging one sidewall, a minor part which is pivoted to the major part, which minor part carries a complementary pad for engaging the opposite sidewall and a lever operated linkage for clamping the pads on the parts of the frame to the tyre. The duct may be of circular cross-section and may have a ring seal at the front edge thereof in order to mate with the wheel hub. Preferably the fan is an axial flow fan supported in a cylindrical housing of a smaller cross-sectional area than the duct and the duct may extend from the housing on the input side of the fan.

The duct may be releasably attached to the clamp assembly by a hook assembly which affords pivotal connection between the frame and the duct, the hook assembly being of adjustable length so as to permit the duct to mate closely with the wheel.

25 BRIEF DESCRIPTION OF DRAWINGS

One embodiment of the invention is now described by way of example with reference to the accompanying drawings wherein

Fig. 1 is a diagrammatic section of the apparatus and the aircraft wheel to which it is applied

Fig. 2 is a side view of the clamp assembly

Fig. 3 is a plan of the clamp assembly.

5 DESCRIPTION OF PREFERRED EMBODIMENT

Referring to Fig. 1, the aircraft wheel has two hub sections 2, 4 clamped together by bolts 6. A multiple disc brake assembly 8 is located within hub section 4. Hub section 12 is pierced by cut-outs 10. The wheel supports a tyre 12. A frame 14 straddles the tyre 12 and crossbar 16 thereon supports a hook assembly 18 which is welded to the struts 20 of the duct 22. The duct is a sheet aluminium frustrum which coaxially overlaps an aluminium motor housing 24 the open end of which is protected by a grid 26. The inlet end of the frustrum has a rolled edge 28 which is protected by a rubber seal 30. An axial flow fan 32 is mounted within the housing 24 on arms 34 (only one shown) and is supplied with 115v DC from a ground supply or from the aircraft generators. The fan produces a flow of 1400 cfm. The duct is stiffened by six tubular struts 36. The hook assembly 18 welded to the upper pair of struts consists of two slotted plates 38 which locate a pin 40 and a pair of tubes 42 each provided with adjustable screws 44 and hooks 46 for engaging cross bar 16.

Referring now to Figs. 2 and 3 the clamping frame 14 consists of a major tubular part 48 provided with a pair of

pads 50 which abut a sidewall of the tyre 12. A minor part 52 of the frame carries complementary pads 54. The major and minor parts of the frame are pivotally connected by pins 56, 58 and normally urged into a clamping position by spring 60 but are openable by use of the lever and linkage 5 62. After a high energy stop the discs may reach 850⁰F. The clamp assembly is fitted to the tyre and the duct sealed to the wheel. Air is drawn through the cut outs creating an air stream over the discs which cool rapidly in the first 10 five minutes. Twenty minutes is generally required to reduce the wheel mass to ambient.

We have found the advantages of the apparatus to be

1. Ease of use due to lightness of construction
2. Adaptability to different sizes of tyres
- 15 3. The apparatus can be applied from positions fore and aft of the wheel so that personnel need not stand in line with the direction of separation of the hubs.
4. The rapid cooling reduces the risk of distortion in the brakes.

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Claims

1. A wheel brake cooling apparatus' for aircraft comprising a clamp assembly for attachment to an aircraft tyre,
a duct adapted to be clamped by the clamp assembly against an aircraft wheel upon which the tyre is fitted,
and a fan arranged, when activated, to draw cooling air through the wheel brake assembly via the duct.
2. Apparatus as claimed in claim 1 wherein the clamp assembly comprises a tyre-straddling, U-shaped frame with a first tyre engaging pad for one sidewall of the wheel and a second tyre engaging pad for the opposite side wall and means to clamp the pads against the tyre.
3. Apparatus as claimed in claim 2 wherein the frame is made of a major part, the length of which exceeds the greatest sidewall to sidewall width of the tyre, which part carries an inwardly directed pad for engaging one sidewall and a minor part which is pivoted to the major part, which minor part carries a complementary pad for engaging the opposite sidewall and a lever operated linkage for clamping the pads on the two parts of the frame to the tyre.
4. Apparatus as claimed in any one of claims 1 to 3 wherein the duct is of circular cross-section and has a ring seal at the front edge thereof in order to mate with



the wheel hub.

5. Apparatus as claimed in any of claims 1 to 3 wherein the fan is an axial flow fan supported in a cylindrical housing of smaller cross-sectional area than the duct and the duct extends from the housing on the input side of the fan.

6. Apparatus as claimed in any one of the preceding claims wherein the duct is releasably attached to the clamp assembly by a hook assembly which affords pivotal connection between the frame and the duct, the hook assembly being of adjustable length so as to permit the duct to mate closely with the wheel.

7. Apparatus as claimed in claim 5 or 6 wherein the duct is made of sheet metal and the mouth of the duct is braced by struts which extend between the mouth of the duct and the fan housing and the hook assembly extends from a cross bar joining a pair of struts to a cross bar on the minor part of the frame.

8. A wheel brake cooling apparatus substantially as herein described with reference to and as illustrated in the accompanying drawings.

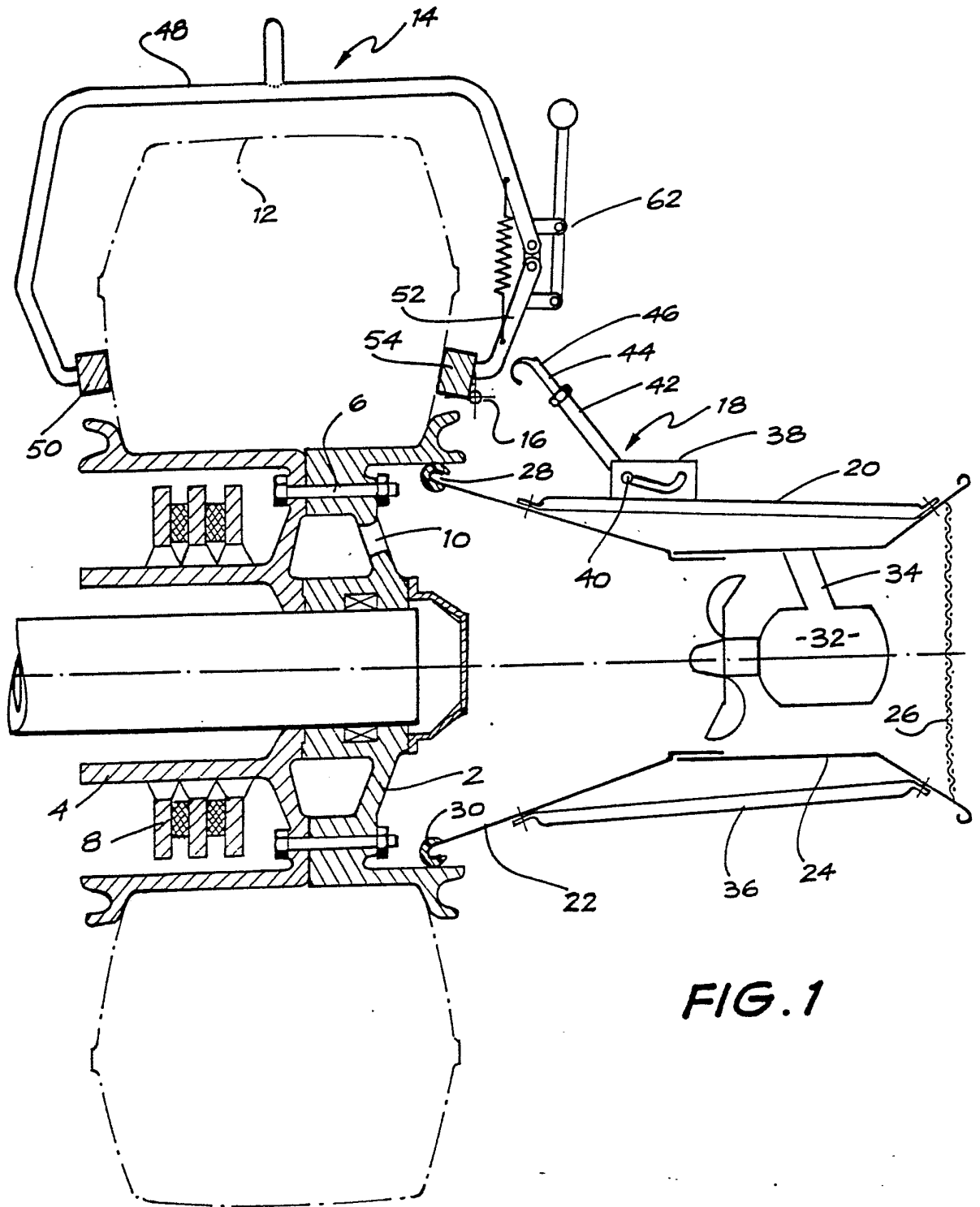


FIG. 1

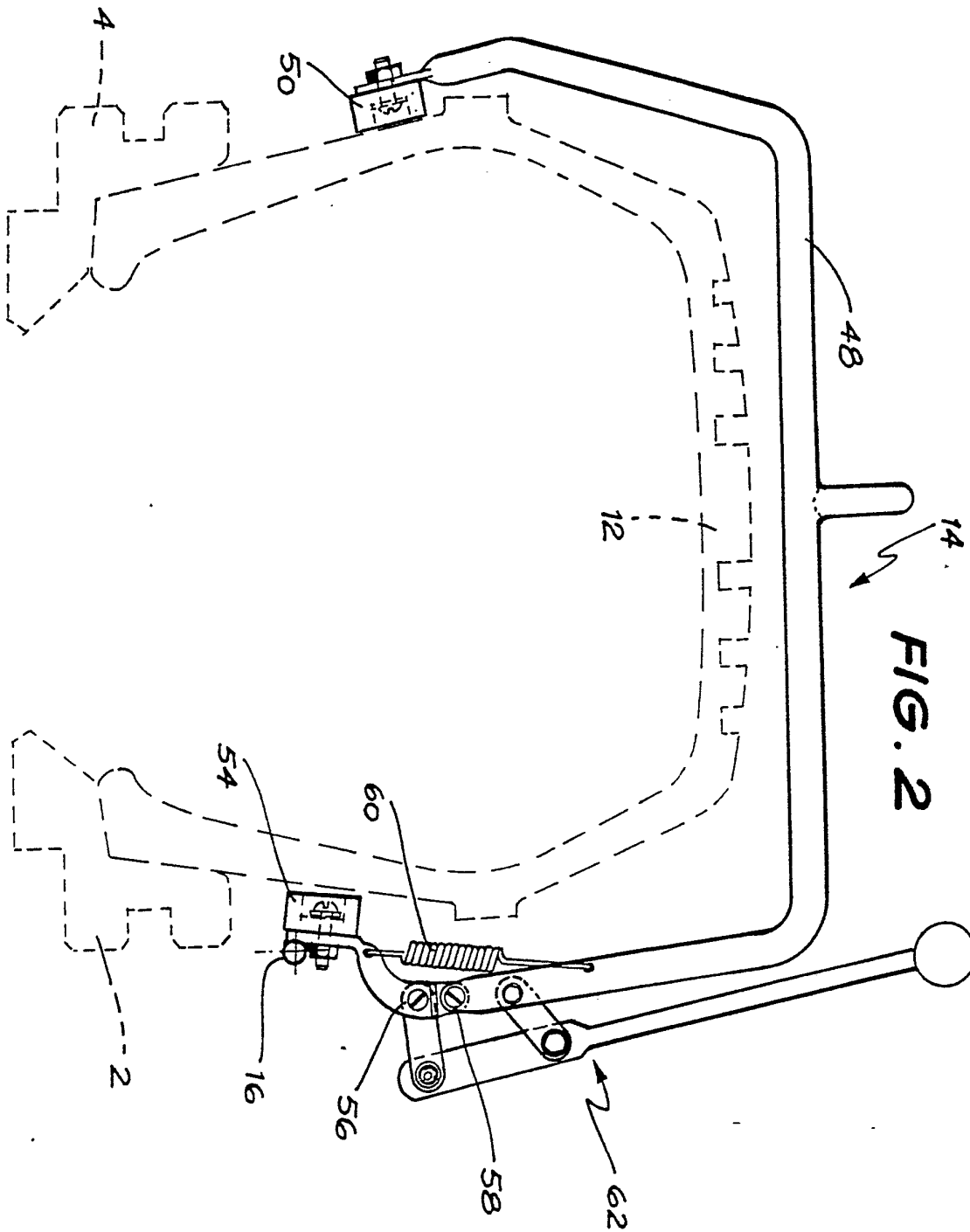


FIG. 2



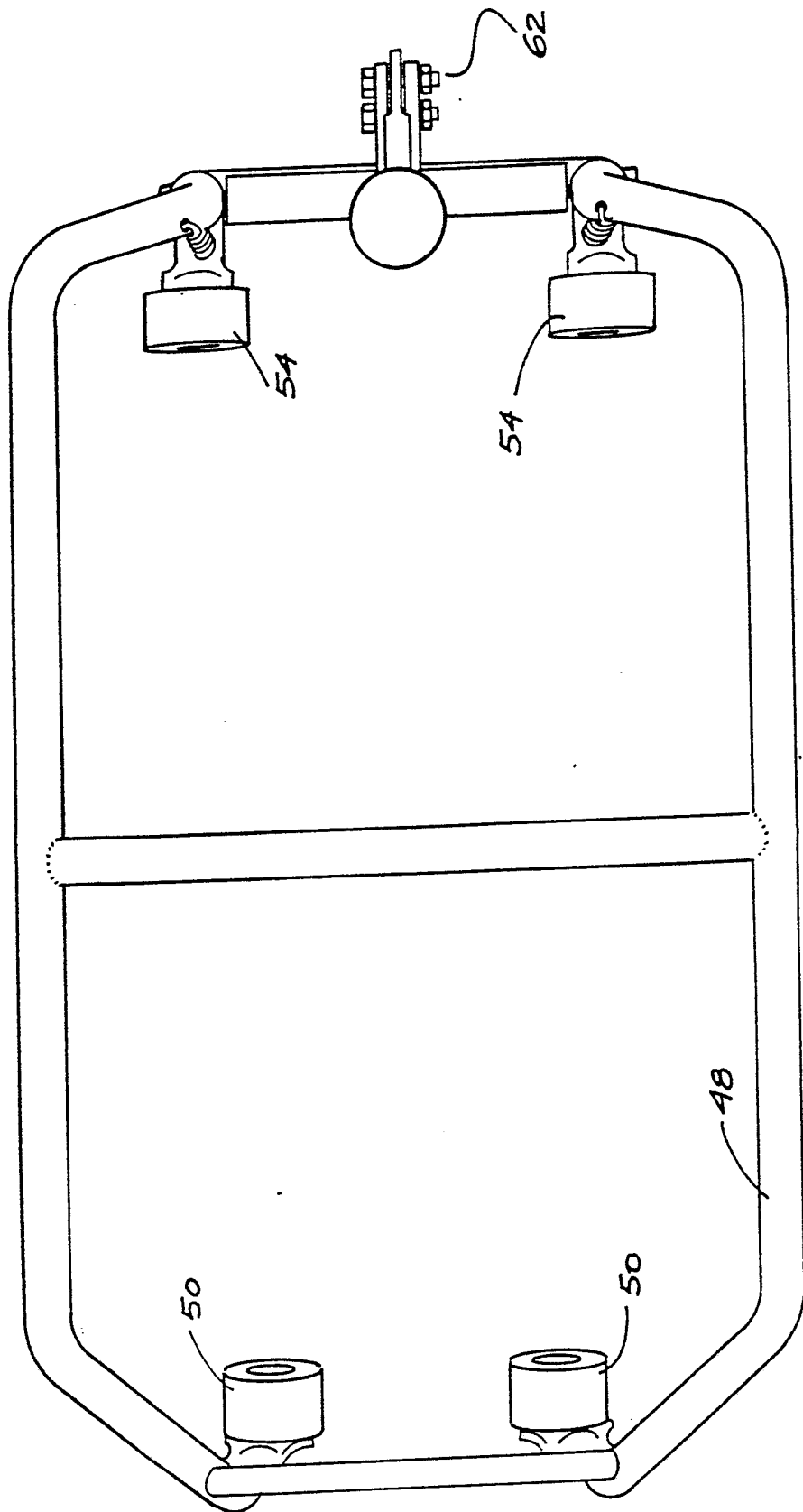


FIG. 3



INTERNATIONAL SEARCH REPORT

International Application No PCT/AU 81/00058

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ³ According to International Patent Classification (IPC) or to both National Classification and IPC Int. Cl. ³ F16D 65/847, B64C 25/42, B64F 5/00	
II. FIELDS SEARCHED Minimum Documentation Searched ⁴	
Classification System	Classification Symbols
IPC	F16D 65/84, 65/847, B64C 25/42, B64F 5/00
US Cl.	188-264A, 188-264R
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁵	
AU : IPC as above, Australian Classification 96.6, 90.3.	
III. DOCUMENTS CONSIDERED TO BE RELEVANT ¹⁴	
Category *	Citation of Document, ¹⁶ with indication, where appropriate, of the relevant passages ¹⁷
	Relevant to Claim No. ¹⁸
X	US, A, 3301357, published 1967, January 31, Cussons (& CH 364696, & DE 1110529)
X	GB, A, 1371336, published 1974, October 23 Dunlop Holdings Limited (& US, A, 3734247)
X	AU, B, 57438/65 (291042), published 1966, October 13, The Bendix Corporation (& FR, A, 1439992)
X	US, A, 2621849, published 1952, December 16, Minnis.
X	US, A, 2708011, published 1955, May 10, Ronning
X	GB, A, 990445, published 1965, April 28, The Goodyear Tire & Rubber Company.
X	US, A, 1971929, published 1934, August 28, Burdick
X	US, A, 2552571, published 1951, May 15, Mercier
X	US, A, 2959255, published 1960, November 8, White.
(continued...)	
* Special categories of cited documents: ¹⁵ "A" document defining the general state of the art "E" earlier document but published on or after the international filing date "L" document cited for special reason other than those referred to in the other categories "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but on or after the priority date claimed "T" later document published on or 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 "X" document of particular relevance	
IV. CERTIFICATION	
Date of the Actual Completion of the International Search ³	Date of Mailing of this International Search Report ²
21 July 1981(21.07.81)	23 JULY 1981 (23-07-81)
International Searching Authority ¹	Signature of Authorized Officer ²⁰
Australian Patent Office	A.S.Moore <i>A. A. Moore</i>

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

- | | |
|---|---|
| X | GB, A, 566830, published, 1945, January 16, Messier Aircraft Equipment Limited. |
| X | US, A, 2687192, published 1954, August 24, Butterfield |
| X | US, A, 2934176, published 1960, April 26, Farkas. |
| E | AU, A, 64548/80, published 1981, May 21, Merle |

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹⁰

This international search report has not been established in respect of certain claims under Article 17(2) (a) for the following reasons:

1. Claim numbers because they relate to subject matter ¹² not required to be searched by this Authority, namely:

2. Claim numbers because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out ¹³, specifically:

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ¹¹

This International Searching Authority found multiple inventions in this international application as follows:

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.

2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:

3. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claim numbers:

Remark on Protest

The additional search fees were accompanied by applicant's protest.

No protest accompanied the payment of additional search fees.