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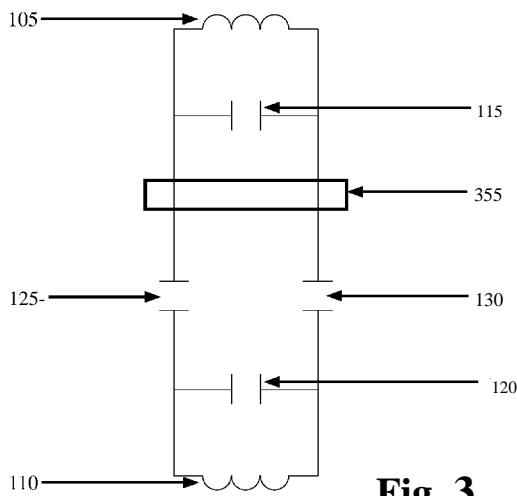


Fig. 3

(57) **Abstract:** The present invention is directed to a method and device of inductive coupling of an idler coil to a parent coil to provide a double resonance circuit without the disadvantages of capacitive coupling to the parent coil. In an embodiment of the invention, an inductive coupling coil can be used to achieve a double-tuned circuit. In an embodiment of the invention, a circuit uses inductive coupling to achieve a double resonance circuit for ³/₄, ¹⁹F, and ¹³C experiments where one of the three nuclei are observed and the other two are decoupled. In an embodiment of the invention a pivot or a shunt can be used to couple and decouple the idler coil and the parent coil.



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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2009/256569 AI (HANCU I LEANA [US] ET AL) 15 October 2009 (2009-10-15) paragraph [0022] - paragraph [0042] figures 1, 2, 4B	32,44,45
X	US 2001/033165 AI (TOMANEK BOGUSLAW [CA] ET AL) 25 October 2001 (2001-10-25) paragraph [0032] - paragraph [0039] figure 1	1-15 , 17 , 19,21 , 22,24, 26,29-45

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2011/025326 AI (ZENS ALBERT P [US]) 3 February 2011 (2011-02-03) paragraph [0021] - paragraph [0028] figure 1 -----	1, 2, 4, 6, 13-16, 20, 22 , 23, 27 , 28, 30, 32, 33 , 35, 37 , 44, 45
X	US 5 483 163 A (WEN HAN [US] ET AL) 9 January 1996 (1996-01-09) col umn 3, line 30 - col umn 5, line 38 figures 1, 2 -----	1-5 , 13-20, 22-28, 30, 32-36, 44, 45
A	w0 2010/018535 AI (KONINKL PHI LI PS ELECTRONICS NV [NL] ; PHI LI PS INTELLECTUAL PROPERTY [DE]) 18 February 2010 (2010-02-18) the whol e document -----	1-45
A	w0 2013/108142 AI (KONINKL PHI LI PS NV [NL] ; PHI LI PS INTELLECTUAL PROPERTY [DE]) 25 July 2013 (2013-07-25) the whol e document -----	1-45

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2009256569	AI	15-10-2009	
		CN 102007421 A	06-04-2011
		DE 112009000823 T5	30-08-2012
		US 2009256569 AI	15-10-2009
		Wo 2009126767 A2	15-10-2009
US 2001033165	AI	25-10-2001	NONE
US 2011025326	AI	03-02 -2011	
		EP 2459993 A2	06-06-2012
		JP 5548269 B2	16-07-2014
		JP 2013501222 A	10-01-2013
		US 2011025326 AI	03-02-2011
		wo 2011014696 A2	03-02-2011
us 5483163	A	09-01 -1996	NONE
Wo 2010018535	AI	18-02 -2010	NONE
wo 2013108142	AI	25-07 -2013	
		CN 104067136 A	24-09-2014
		EP 2618171 AI	24-07-2013
		EP 2807497 AI	03-12-2014
		JP 2015503431 A	02-02-2015
		RU 2014133719 A	20-03-2016
		US 2015002156 AI	01-01-2015
		wo 2013108142 AI	25-07-2013