

TABLE S1 : Selection of patent related to rapeseed dehulling and hulls purification

Patent reference	Title	Inventors	Priority date	Description
CN101099428 (A)	Thresher for rape	YUCAI LIU	2006	The mixture of hulls and kernels is put in agitation in a hemicylindrical device by a beater. A fan is used to blow the hulls away.
CN101438849(A)	Machine for separating kernel and shell of vegetable seed	ZIMING LI [CN]; HAI XIANG [CN]; HAIJUN ZHOU [CN]; XIAODONG LEI [CN]; SHAOHUA LI [CN]; RENSHENG MOU [CN]; LUPENG WANG [CN]; LONGCHANG ZHOU [CN]; JUNHAI WANG [CN]; GUOPING WEI [CN]; DEHAO BAO [CN]	2008	beater + fan separation by pneumatic transport
CN103555414 (A)	Hulling separation method for rapeseeds and special separation device	WU LIANGXIN	2013	Drying (air at 160°C), crushing then separation on vibrating sieve + air flow
CN104293480A	Rapeseed peeling method suitable for cold pressing oil preparation	JIANG SHAOTONG; LUO SHUIZHONG; PAN LIJUN; WU XUEFENG; ZHENG ZHI	2014	Pretreatment by sonication, drying, seed breaking and sorting (any method)
CN104877756A	Rapeseed peeling method used for making oil through cold pressing	JIANG SHAOTONG; LUO SHUIZHONG; PAN LIJUN; WU XUEFENG; ZHENG ZHI	2015	Pretreatment by microwave heating, then breaking and sorting (any method)
CN106111516A	Hull and kernel separation mechanism of peanut huller	DONG XIAOFEI; LIU SHANG; WANG BIN; WU YUN	2016	Dehulling apparatus with hulls separation by suction on a vibrating table
CN106350205A	Rapeseed dehulling separation process	TONG MINGXUN; TONG WENXUN	2016	Humidification (steam), cooling (negative temperature), then hot air 100-120°C and H ₂ O reduction at 6.8%, then pneumatic transport in spiral tube and separation in the air stream.
CN112492980A	Agricultural oilseed rape threshing device	不公告发明人	2020	Device for disintegrating rapeseed and separating it by ventilation.
CN1458252A	Raw material oil pressing process with separated rapeseed shell and kernels	LUO YONGZONG [CN]	2002	Preliminary classification of the seeds by sieve, preheating followed by fast cooling, seeds breaking between toothed rolls, separation on vibrating screens. Extraction of the oil in hulls by leaching (with a solvent)
CN202808747U	Rapeseed peeling and separating device	WANG ANTI; WANG CHANGYAN	2012	Dehulling on a roller mill equivalent and then a combination of sieving, fluidization and hulls aspiration.
CN203144369U	Rapeseed pneumatic huller with hull-kernel separation chamber	XUAN BOMIN	2013	Pneumatic propulsion for both impact and separation

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CN203380112U	Separating sieve	LI QUANSHENG	2013	The hulls are blown on the surface of a first sieve to fall on a second one which ensures their purification.
CN207735250U	Vegetable seed shelling and shell benevolence separation and collection device	PU ZHENGUI	2017	Starting from any hulling method - the separation is completed by the action of a brush that removes the kernels from the skins. According to the drawing, a fan makes the final separation.
CN209722076U	Hull-kernel separator for cottonseed oil pressing	FANG YUNJIAO; LI HONGJUN; LOU YUANMIN; ZHANG XUEMIN	2019	No available translation but drawing makes be sure that it is not the same process as ours.
CN209952960U	Environment-friendly rapeseed hull sorting and grinding device	WANG RU	2019	Airflow separation method coupled with hulls milling
CN212910850U	Disc-type rapeseed threshing filter	SU WEN	2020	The function of the invention is not very clear. We can suppose that it is a question of dehulling after passage on a beater in the form of a horizontal disc then a sieving (?)
CN2243334Y	Rape-seed hull removing and separating apparatus	DONGSHENG WU [CN]; LIMING YU [CN]; YOUXIAN WEN [CN]	1995	Cone shaped dehuller with adjustable gap between rotor and stator. Separation by sieving and aspiration.
DE4041994 (A1)	Rape seed shell removal - uses rollers to mill sorted and dried seeds followed by beating and sifting to detach shells from the kernels	KOCH WOLFGANG [DE]; RELITZ HARTMUT [DE]; SCHOLZ GUENTHER [DE]; SPECHT PETER [DE]; RASEHORN HANS-JUERGEN DR [DE]; BARTELS BURKHARD [DE]; SACHSE JOACHIM DR ING [DE]	1990	Seeds drying (<2%), breaking between rolls, air transportation (for shaking to detach fractions) and final separation by electric field (claim less than 5% of kernels residues)
EP2550106A1	Method and device for dehulling rapeseed seeds.	NYENHUIS MARKUS	2013	Patent for a technical itinerary comprising a combination of classical steps (impact, air column, hulls sieving.
FR7724660A	Apparatus for small seeds dehulling	CETIOM – Evrard Jacques	1977	Centrifuge propeller projecting seeds against a wall.
GB2005526A	Dehulling of rapeseed or mustard defatted meals	CANADIAN PATENTS & DEVELOPMENT LTD	1977	Method of separation in solvent by use of hydrocyclones.

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US3732108A	RECOVERY OF AND SEED MEAT FROM THIOGLUCOSIDE-CONTAINING OILSEED	EAPEN K; SIMS R; TAPE N	1973	Wet process: myrosinase inactivation, wetting, hull separation (but not extraction) and glucosinolates extraction, drying, then hexane extraction, desolventization, sieving for protein rich fraction and film rich fraction
US6326035B1	Method for the separation of rapeseed germ and rapeseed germ oil	MORINAGA YASUSHI [JP]; NAKAMURA TORU [JP]; NAKATANI AKIHIRO [JP]; NARUSE MASAYOSHI [JP]; OZAWA YOICHI [JP]	1999	Use of the centrifuge dehuller, aspiration of the hulls + purification of the "hulls" by sieving
WO2014060494A1	PROCÉDÉ PERFECTIONNÉ DE BROYAGE DE MATIÈRE OLÉAGINEUSE	LE CLEF ETIENNE [BE]	2012	Pretreatment for improving the grinding of oilseeds

Table S2: selection of patent related to classification B07B13 + “adherence” or “stick”

Patent reference	Title	Inventors	Priority date	Description
AU663807B2	Thermal sorting	ROSS VICTOR EMUL; JENNINGS BERNARD ALAN; LEVITT CHARLIE MAURICE; KOFLER MATTHIAS	1995	Materials with different melting temperature are heated on a transportation belt. The melt material sticks on the belt when it pass on a drum for the backward return. Non adherent material falls at a different place from the adherent material.
DE4130156 (A1)	Separating glass fragments and labels in bottle washer - involves directing incident stream of wet material mixture onto rotating surface of cylinder where labels adhere and glass fragments drop off	BOEHME KLAUS	1993	A device for removing glass from residues of labels produced by a bottle washing machine. The materials are separated on the rotating surface of a cylinder on which glass does not adhere while labels hold.
EP2060330A2	Process for resin separation	MIYASAKA MASATOSHI; SAKAI YASUHIKO; NAKA HIROYUKI; TABATA DAISUKE; ISOMI AKIRA; KOJIMA TAMAO	2008	A mixture of resins with different transition temperatures is heated to a temperature where it becomes possible to make one resin able to adhere under pressure to a separating member and to be later detached by a blade.
FR2243736 (A1)	Separation of diamonds from crushed diamond-bearing minerals - by adhesion to a rotating metal drum partially immersed in water	YAKUTSKY P	1975	The difference in adhesive properties of diamonds vs. their associated minerals is employed to separate diamonds from crushed ores. Diamonds adhere more rapidly than the associated minerals, and also produce a bond which is more stable in the presence of water . By applying both materials to adhesive under pressure and then immersing in water, the associated minerals fail to adhere while the diamonds must be mechanically removed
GB1573533A	SORTING METHOD AND APPARATUS USING DIFFERENTIAL PROJECTION AND ADHESION	BUREAU DE RECHERCHES GEOLOGIQUES ET MINIERES	1976	Use of an inclined transport belt on which material rebound or adhere according to its density.
GB191409172	Method of and Apparatus for Separating Mixed Seeds	BRIMONT JULES LOUIS	1915	Lucern and clover seeds are separated from plantin seeds by application of moisture followed by contact under pressure against a surface. Plantin seeds adhere strongly while lucerne nor cloves seeds are losing their weak capacity of adhesion when heat it applicated to the cylinder..
GB2151949A	Worm separation equipment	PRICE JAMES STANLEY	1983	A device to remove worms from organic material (compost) by spreading the material containing worms on a transportation belt and then submitting the material to the contact of a rotating brush on which worms sticks.
GB404603 (A)	Improvements relating to processes and devices for selecting materials of different shapes or natures	ALEXIS DESIRE ELIE	1934	Process using differences in friction capacity to separate particles on inclined belt or cones. The trajectory of the materials are deviated according to their surface properties and recovered in separated areas.

Patent reference	Title	Inventors	Priority date	Description
JPS6443380 (A)	ADHESION APPLICATION TYPE PARTICLE SHAPE SEPARATOR	SANO SHIGERU; YASHIMA SABURO	1989	The purpose of this apparatus is the separation of finely ground particles (50-100m) according to their shape using a glass cylinder in presence of moist air. Aspherical shaped bodies adhere to the vibrating cylinder while spherical are not. They are disposed on the upper part of the cylinder; non-adherent particles fall before passing under the horizontal axis of the cylinder while adherent ones fall it.
RU95103035 (A)	METHOD AND DEVICE FOR SORTING PARTICLES OF MATERIAL	LEVITT CHARLI MORIS; VERKHUFEN POL; ROSS VIKTOR EHMUL	1997	Process of separation based on heat properties. Diamond differs from rocks debris in specific heat. The mixture is cooled at a temperature below freezing. Transfer of heat between non-diamond particles is greater than with diamond particles resulting in difference mass of ice formation around the particles resulting in weaker sticking allowing diamond to fall before non-diamond particles.
US2011042278 (A1)	METHOD AND APPARATUS FOR SEPARATING FINES FROM ROCK	JANSSEN BILL M	2011	An inclined conveying belt is sprayed by water and moving upward. It receives a flow of ground rocks . The dust sticks to the conveyor and moves up while the rocks are rolling down.
US3288283 (A)	Adhesion process for separating phosphate from clay	CLARY JOE D; MATONEY JOSEPH P	1966	The apparatus is composed of two horizontal cylinders separated by a small distance. Mixture of clay with at least one of the cylinders having a deformable surface. Clay and phosphate ore mixture are driven between the rolls and clay is flattened and adheres to one of the surfaces while ore does not. A scrapper then removes the clay.
US3670882 (A)	APPARATUS FOR SEPARATING MEAT AND BONES INCLUDING BONE ELEVATOR	CONRAD LUCAS J; POPE RAYMOND C	1972	The separator is a cylindrical drum having its axis inclined to the horizontal and rotating about that axis. Meat pieces stick to the drum and are carried upwardly and deposited on a conveyor located just under the top of the drum. The bones move down the bottom of the rotating drum and fall by gravity out the lower end
US4141450 (A)	Method and apparatus for sorting mixtures of materials by ballistic effect and differential adherence	CLIN FRANCOIS H; GONY JEAN-NOEL M; PROUST FRANCOIS O	1979	Apparatus for sorting minerals based on their capacity to adhere to a conveying belt. The conveying belt is inclined, and the minerals are dropped from above so that non adhering material rebound and is rejected while adhering material is carried upward.
US4258851 (A)	Raisin separating machine	LION HERBERT A; LION JR ALFRED	1981	Machine for removing raisins spoiled by mold from good raisins . An angularly disposed rotating screened cylinder causes raisins to be lifted and dropped to the bottom of the cylinder. Because of the fact that the bad raisins are soft and sticky they will stick to the screen. Good raisins will be tumbled towards the bottom of the screened cylinder and out.

Patent reference	Title	Inventors	Priority date	Description
US5660282 (A)	Method and apparatus for separating resource materials from solid waste	DJERF TOBIN [US]; DAMICO GWEN	1997	The patent describes a process in which waste like plastics of different natures are separated by specific heating close to melting point of one of the components and the melting material is separated from the rest by adhesion on conveying belt.
WO9411125	A METHOD AND DEVICE FOR SEPARATING COMPONENTS FROM A COMPOSITE QUANTITY OF MATERIAL	VAN DOORNE HENRICUS WILHELMUS	1994	Material with different water content conveyed by a belt pass in contact with a cylinder garnered with frets where moist material can adhere and is removed from the dry or lesser wet material (example flesh / fat, dry raisin and stones).