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(54) Title: CONVEYOR FEEDER APPARATUS

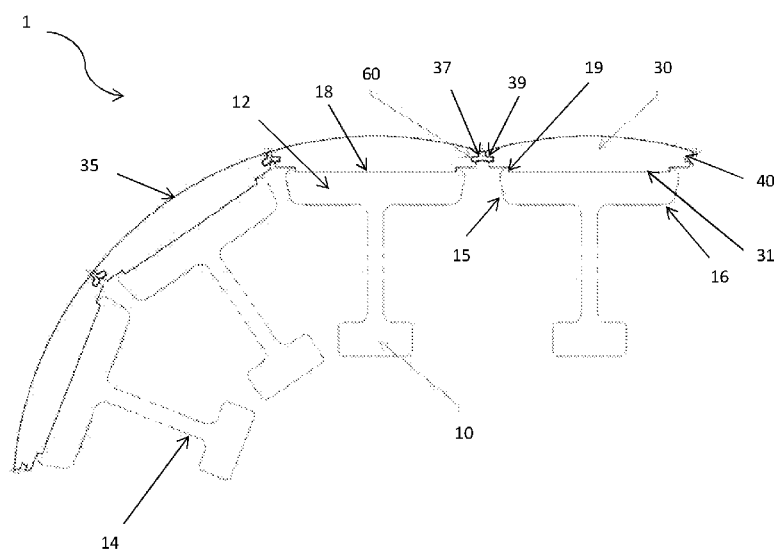


Fig. 1

(57) Abstract: A conveyor feeder apparatus comprises a plurality of cross-bars arranged in a closed loop and connected to at least one track chain for providing drive to the plurality of cross-bars. The apparatus includes a plurality of feeder pans, each feeder pan having a carrying surface and being supported by a cross-bar of the plurality of cross-bars for conveying transport therewith. A seal is provided between the carrying surfaces of adjacent feeder pans and is adapted for sealing connection between the carrying surfaces of adjacent feeder pans.



EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV,
MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM,
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"Conveyor feeder apparatus"**Technical Field**

[0001] This invention relates to a feeder/conveyor assembly and more particularly to a feeder pan arrangement for the same.

Background

[0002] Apron feeders are extensively used in the mining industry for feeding heavy, abrasive ores from storage bins to downstream processing equipment. The apron feeders include steel feeder pans that are supported and driven by track chains.

[0003] Whilst apron feeders of this type are well suited to conveying larger rocks and lumps of ore, finer material can leak between the steel feeder pans. The feeder pans are not easy to clean. Fine material can adhere to the surface of the steel feeder pans and, as a result, be 'carried back' through the feeder. The adhered material can also cause spillage beneath the apron feeder. The leaked and spilled material beneath the apron feeder requires an additional mechanism to collect it.

[0004] Conveyor belt feeders connected to steel supporting cross-bars that are driven by track chains are known and, when used to transport ore material, can prevent leakage of fine material or, potentially, liquid through the conveying surface, providing a significant reduction in the carry back of fine material. However, the belt surface of conveyor belt feeders wears much faster than steel and can become ripped or punctured by larger rocks. Replacement of a worn belt can be time consuming and difficult.

[0005] The present invention aims to provide an improved feeder apparatus and to mitigate one or more of the above problems associated with existing feeders at least to an extent.

[0006] Any discussion of documents, acts, materials, devices, articles or the like which has been included in the present specification is not to be taken as an admission

that any or all of these matters form part of the prior art base or were common general knowledge in the field relevant to the present disclosure as it existed before the priority date of each of the appended claims.

Summary

[0007] Throughout this specification the word "comprise", or variations such as "comprises" or "comprising", will be understood to imply the inclusion of a stated element, integer or step, or group of elements, integers or steps, but not the exclusion of any other element, integer or step, or group of elements, integers or steps.

[0008] In a first broad aspect, the present invention provides a conveyor feeder apparatus comprising a plurality of cross-bars arranged in a closed loop and connected to at least one track chain for providing drive thereto; a plurality of feeder pans, each feeder pan having a carrying surface and being supported by a cross-bar of the plurality of cross-bars for conveying transport therewith; and a seal disposed between and adapted for sealing connection between the carrying surfaces of adjacent feeder pans. As such, the amount of material lost due to leakage from the conveyor feeder apparatus is minimised whilst allowing for the retention of a robust, abrasion resistant conveying surface that provides long wear life. Individual feeder pans are easily replaceable in comparison to a belt surface.

[0009] In an embodiment, each feeder pan includes a fore side and an aft side, the fore side and the aft side each including a seal retention groove, and wherein the seal has a first protrusion adapted for retention in the seal retention groove of the aft side of a first feeder pan, a second protrusion adapted for retention in the seal retention groove of the fore side of an adjacent feeder pan and a third protrusion adapted to provide a sealing connection between the carrying surface of the first feeder pan and the carrying surface of the adjacent feeder pan.

[0010] In an alternative embodiment, each feeder pan includes a fore side and an aft side, the fore side and the aft side each including an upper flange and a recessed base

portion; each cross-bar has an upper surface adapted for receiving the recessed base portion therein such that a seal retention gap is formed between the upper flange and the upper surface of the cross-bar; wherein the seal has a first protrusion adapted for retention in the seal retention gap formed between the upper flange of a first feeder pan and the upper surface of a first cross-bar, a second protrusion adapted for retention in the seal retention gap formed by the upper flange of an adjacent feeder pan and the upper surface of an adjacent cross-bar, and a third protrusion adapted to provide a sealing connection between the carrying surface of the first feeder pan and the carrying surface of the adjacent feeder pan.

[0011] In some embodiments, the conveyor feeder apparatus includes a scraper adapted for cleaning material from the carrying surface of each feeder pan as it is conveyed past the scraper.

[0012] In some embodiments, the carrying surface of each feeder pan is generally convex. In this manner, the carrying surface can be easily accessed by the scraper to clean off material that has adhered to the carrying surface, reducing the amount of material that is carried back around the conveyor feeder apparatus.

[0013] In some embodiments, the feeder pan comprises a wing at either side of the carrying surface that is adapted for containing material to be transported on the carrying surface of the feeder pan. The feeder pan may also include a pair of fastening flanges arranged externally of the wings, the flanges each being adapted for receiving a fastening member therein for attachment of the feeder pan to the cross-bar. This arrangement separates the bolts from the carrying surface, minimising the possibility of fine material becoming stuck to the fastening members or into small gaps between fastening members and the flanges. It also ensures that the scraper can operate effectively to clean the carrying surface.

Brief Description of Drawings

[0014] One or more embodiments of the invention will now be described by way of specific example(s) with reference to the accompanying drawings, in which:

[0015] Fig. 1 is a schematic side view of a portion of a conveyor feeder apparatus according to a first embodiment of the invention;

[0016] Fig. 2 is a schematic side view of a portion of a conveyor feeder apparatus according to a second embodiment of the invention;

[0017] Fig. 3a is a side profile view of the seal of the embodiment of Fig. 1;

[0018] Fig. 3b is a side profile view of the seal of the embodiment of Fig. 2;

[0019] Fig. 4 is a schematic side view of a discharge end of the conveyor feeder apparatus of either the first or the second embodiment of the invention;

[0020] Fig. 5a is a schematic front view of a wing and flange of a feeder pan in accordance with the invention;

[0021] Fig. 5b is a side elevation view of the feeder pan of Fig. 5a; and

[0022] Fig. 6 is a front view of an upper platform of the cross-bar.

Description of Embodiments

[0023] Fig. 1 shows a schematic partial side view of a first embodiment of a conveyor feeder apparatus 1. The conveyor feeder apparatus 1 includes a plurality of cross-bars 10 supporting a plurality of feeder pans 30. Four of the cross-bars 10 are shown in side view in Fig. 1, attached to four corresponding feeder pans 30.

[0024] Each cross-bar 10 has a generally T-shaped profile, having an upper platform 12 and a central arm 14 depending from the upper platform 12 towards an interior of the conveyor feeder apparatus 1. The upper platform 12 of each cross-bar 10 is generally rectangular in plan view and is attached at its shorter sides to a pair of parallel track chains 50, seen in Fig. 6, that are arranged in a closed loop about a drive sprocket 52, shown schematically in Fig.4 at the discharge end of the conveyor feeder apparatus 1 and an idler sprocket (not seen) at an aft end of the conveyor feeder apparatus 1. The plurality of cross-bars 10 is arranged in a closed loop on the track chains 50 and is conveyed around the closed loop by the track chains 50. The cross-bars 10 are spaced from one another with sufficiently large gaps to allow for unhindered movement of the cross-bars 10 around the conveyor feeder apparatus. In the direction of travel of the track chains 50, each cross-bar 10 has a fore end 15 and an aft end 16.

[0025] An upper surface 18 of the upper platform 12 of each cross-bar 10 includes an upper recess 19 in which the feeder pan 30 is received.

[0026] The feeder pans 30 of the first embodiment of the invention comprise of machined steel components having a rectangular base 31 corresponding to the plan area of the upper recess 19 so as to be received therein with a close fit. Above the base 31, the feeder pan 30 extends in length beyond the length of the upper platform 12. The feeder pans 30 have an upper carrying surface 35 with a convex profile, when viewed in side view, upon which material to be transported rests during operation of the conveyor feeder apparatus 1. The feeder pan 30 has a fore side 39 and an aft side 37, each of which include a seal retaining groove 40 extending the width thereof. When any two feeder pans 30 of the plurality of feeder pans 30 is received in the upper recess 19 of the upper platforms 12 of a corresponding pair of cross-bars 10, the aft side 37 of a first of the two feeder pans 30 lies close to the fore side 39 of a second or adjacent feeder pan 30, producing a small gap between the two sides. The gap is filled with a seal 60.

[0027] The seal 60 comprises an elongate rubber element that extends between the aft side 37 of the first feeder pan 30 and the fore side 39 of the adjacent feeder pan 30.

The seal 60, best seen in Fig. 3a, has a profile consisting generally of three protrusions; a first fore protrusion 62, a second aft protrusion 64 and a third upper protrusion 66. The first fore protrusion 62 is rounded to fit with a sealing fit into the seal retaining groove 40 of the aft side 37 of a feeder pan 30 so as to be retained therein. Similarly, the second aft protrusion 64 is rounded to fit with a sealing fit into the seal retaining groove 40 of the fore side 39 of a feeder pan 30 so as to be retained therein. The upper protrusion 66 has a tapered shape to fit the gap between an upper portion of the aft side 37 and an upper portion of the fore side 39 with a sealing fit so that fine material does not leak into the gap between the feeder pans 30. Between each protrusion 62, 64, 66 is a small notch 67 cut into the seal 60 to allow the flexing of the protrusions 62, 64, 66 relative to one another as the feeder pans 30 are transported around the conveyor feeder apparatus 1. The seal 60 is made of rubber or other flexible material such as soft polyurethane that allows high amounts of strain with minimal strain hardening, or fatigue, effects. As such, the seal 60 is capable of flexing with the transport of the feeder pans 30 around the conveyor feeder apparatus 1 to maintain the sealing fit between the carrying surfaces 35 of the feeder pans 30 to which it is fitted. The seal 60 therefore provides a sealing fit between the carrying surfaces 35 of the feeder pans 30 even whilst the feeder pans 30 are in motion.

[0028] Each of the feeder pans 30 are attached to the upper platform 12 of the cross-bar 10 using bolts 65 (seen in Fig. 6) fastened through holes 41 (best seen in Fig. 5a, Fig. 5b) drilled through both the feeder pan 30 and the upper platform 12. The feeder pan 30 includes a wing 43 at either side of the carrying surface 35 as shown in Fig. 5a and Fig. 5b, so as to contain material being transported on the carrying surface 35 and prevent it falling off the side edges. Externally of the wings 43 is a horizontal flange 45 that includes the drilling holes 41. Fastening the feeder pan 30 to the cross-bar externally of the carrying surface 35 minimises the possibility of fine material collecting around the holes 41 and the bolts 65 that can cause carry back or spillage.

[0029] As shown schematically in Fig. 4, as the track chains 50 and hence the feeder pans 30 reach the drive sprocket 52 at the discharge end of the conveyor feeder apparatus, they wrap around the drive sprocket 52. The convex carrying surfaces 35 of

the feeder pans 30 create a continuous semi-cylindrical surface as they pass around the drive sprocket 52. A scraper 70 is positioned adjacent the feeder pans 30 ahead of drive sprocket 52 and passing underneath the feeder pans 30. The continuous curve of the carrying surfaces 35 provides easy access for the scraper 70 to clean the carrying surfaces 35 to minimise the amount of material being carried back through the conveyor feeder apparatus or being spilled onto the ground below it.

[0030] Fig. 2 shows a schematic partial side view of a second embodiment of the conveyor feeder apparatus 1. The second embodiment is very similar to the first embodiment but differs in some details of the feeder pan, cross-bar and seal as will be described below. The second embodiment of the conveyor feeder apparatus 1 includes a plurality of cross-bars 100 supporting a plurality of feeder pans 300. Four of the cross-bars 100 are shown in side view in Fig. 2, attached to four corresponding feeder pans 300. The cross-bars 100 are substantially identical to the cross-bars 10 and include an upper platform 120 that has an upper recess 190 that is substantially identical to the upper recess 19 and a central arm 140 that is substantially identical to the central arm 14. An upper surface 180 of the cross-bars 100 is machined to a horizontal surface fore and aft of the upper recess 180.

[0031] The feeder pans 300 of the second embodiment of the invention comprise machined steel components having a rectangular base 310 corresponding to the plan area of the upper recess 190 of the upper platform 120 so as to be receivable therein with a close fit. The feeder pans 300 have an upper carrying surface 350 with the same convex profile as the feeder pans 30, when viewed in side view, upon which material to be transported rests during operation of the conveyor feeder apparatus 1. The feeder pans 300 differ from the feeder pans 30 in that a fore side 370 and aft side 390 of the feeder pan 300 do not have seal retaining grooves, but instead consist of an upper flange 330 that undercuts directly beneath the carrying surface 350 to the narrower base 310 profile. The base 310 is received in the upper recess 190 of the cross-bar 100 such that a seal retention gap is formed between an underside of the upper flange 330 and the upper surface 180 of the cross-bar 100.

[0032] A seal 600 has a first fore protrusion 620 shaped for a sealing fit in the seal retention gap formed by the upper flange 330 of a first feeder pan and the upper surface 180 of a first cross-bar 100, so as to be clamped and retained between the two. A second protrusion 640 is shaped for clamping retention in the seal retention gap formed by an underside of the upper flange 300 of an adjacent feeder pan and the upper surface 180 of the adjacent cross-bar 100. A third protrusion 660 is tapered to provide the sealing connection between the upper flanges 330 and hence the carrying surfaces 350 of the first feeder pan 300 and the adjacent feeder pan 300. Between each protrusion 620, 640, 660 is a small notch 670 cut into the seal 600 to allow the flexing of the protrusions 620, 640, 660 relative to one another as the feeder pans 300 are transported around the conveyor feeder apparatus 1. The seal 600 also includes an inverted v-shaped pair of protrusions 680 in an underside thereof that rest over the edges of a fore side 150 and an aft side 160 of the upper platform 120 and assist to retain the seal 600 in position as the feeder pans 300 are transported around the feeder conveyor apparatus.

[0033] The feeder pans 30, 300 are described in the embodiments above as being made from steel. Steel provides for the ability to handle large sharp rocks without damage to the conveying surface and the pans can transfer large shear loads without sustaining damage. However, the skilled person will appreciate that the feeder pans 30, 300 can be manufactured from a number of materials, including steel or a steel alloy in a high load/wear application or plastic, rubber or polyurethane for lighter duty applications.

[0034] The track chains 50 and therefore the feeder pans 30, 300, together wear over time and, as such, the pitch of the chains will gradually increase over time. The interface between the feeder pans 30, 300 and the respective seal 60, 600 has been designed to ensure that the seal is retained in place and provides an effective seal over the wear life of the chains.

[0035] It will be appreciated by persons skilled in the art that numerous variations and/or modifications may be made to the above-described embodiments, without departing from the broad general scope of the present disclosure. The present

embodiments are, therefore, to be considered in all respects as illustrative and not restrictive.

CLAIMS:

1. A conveyor feeder apparatus comprising a plurality of cross-bars arranged in a closed loop and connected to at least one track chain for providing drive to the plurality of cross-bars; a plurality of feeder pans, each feeder pan having a carrying surface and being supported by a cross-bar of the plurality of cross-bars for conveying transport therewith; and a seal disposed between and adapted for sealing connection between the carrying surfaces of adjacent feeder pans.
2. A conveyor feeder apparatus as claimed in claim 1, wherein each feeder pan includes a fore side and an aft side, the fore side and the aft side each including a seal retention groove, and wherein the seal has a first protrusion adapted for retention in the seal retention groove of the aft side of a first feeder pan, a second protrusion adapted for retention in the seal retention groove of the fore side of an adjacent feeder pan and a third protrusion adapted to provide a sealing connection between the carrying surface of the first feeder pan and the carrying surface of the adjacent feeder pan.
3. A conveyor feeder apparatus as claimed in claim 1, wherein each feeder pan includes a fore side and an aft side, the fore side and the aft side each including an upper flange and a recessed base portion; each cross-bar has an upper surface adapted for receiving the recessed base portion therein such that a seal retention gap is formed between the upper flange and the upper surface of the cross-bar; wherein the seal has a first protrusion adapted for retention in the seal retention gap formed between the upper flange of a first feeder pan and the upper surface of a first cross-bar, a second protrusion adapted for retention in the seal retention gap formed by the upper flange of an adjacent feeder pan and the upper surface of an adjacent cross-bar, and a third protrusion adapted to provide a sealing connection between the carrying surface of the first feeder pan and the carrying surface of the adjacent feeder pan.
4. A conveyor feeder apparatus as claimed in any one of the preceding claims, wherein the conveyor feeder apparatus includes a scraper adapted for cleaning material from the carrying surface of each feeder pan as it is conveyed past the scraper.

5. A conveyor feeder apparatus as claimed in any one of the preceding claims, wherein the carrying surface of each feeder pan is generally convex.
6. A conveyor feeder apparatus as claimed in any one of the preceding claims, wherein the feeder pan comprises a wing at either side of the carrying surface that is adapted for containing material to be transported on the carrying surface of the feeder pan.
7. A conveyor feeder apparatus as claimed in claim 6, wherein the feeder pan includes a pair of fastening flanges arranged externally of the wings, the flanges each being adapted for receiving a fastening member therein for attachment of the feeder pan to the cross-bar.

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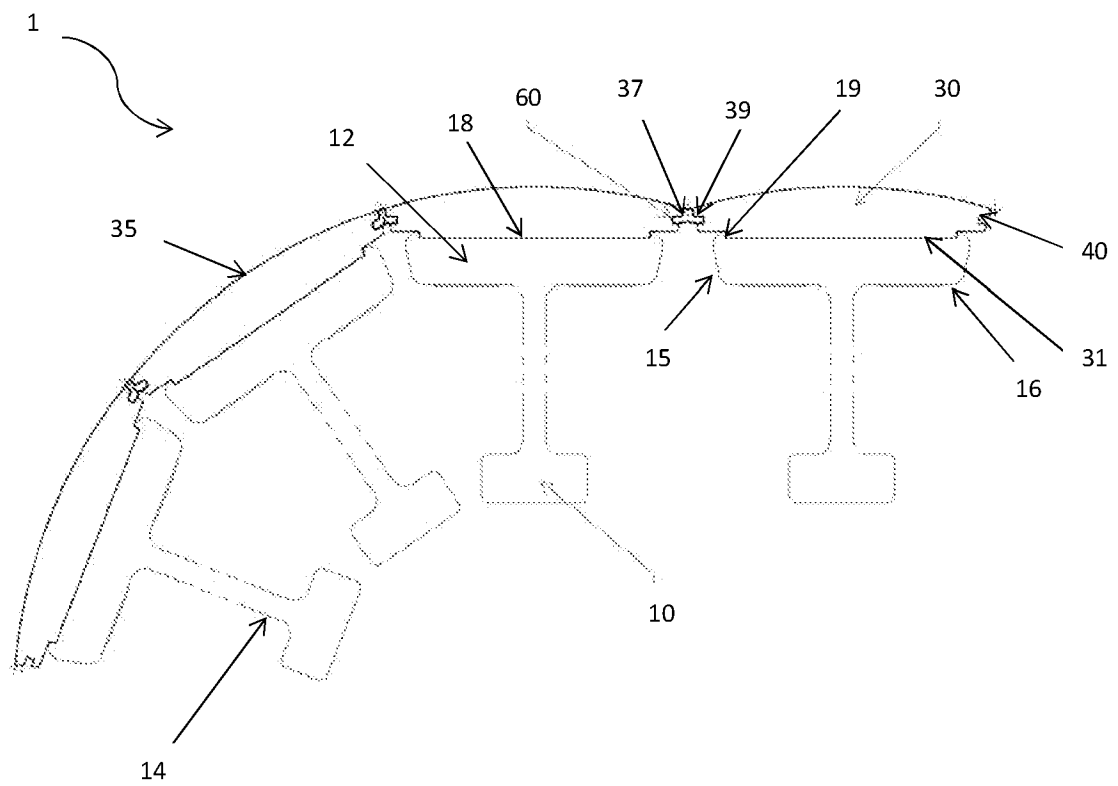


Fig. 1

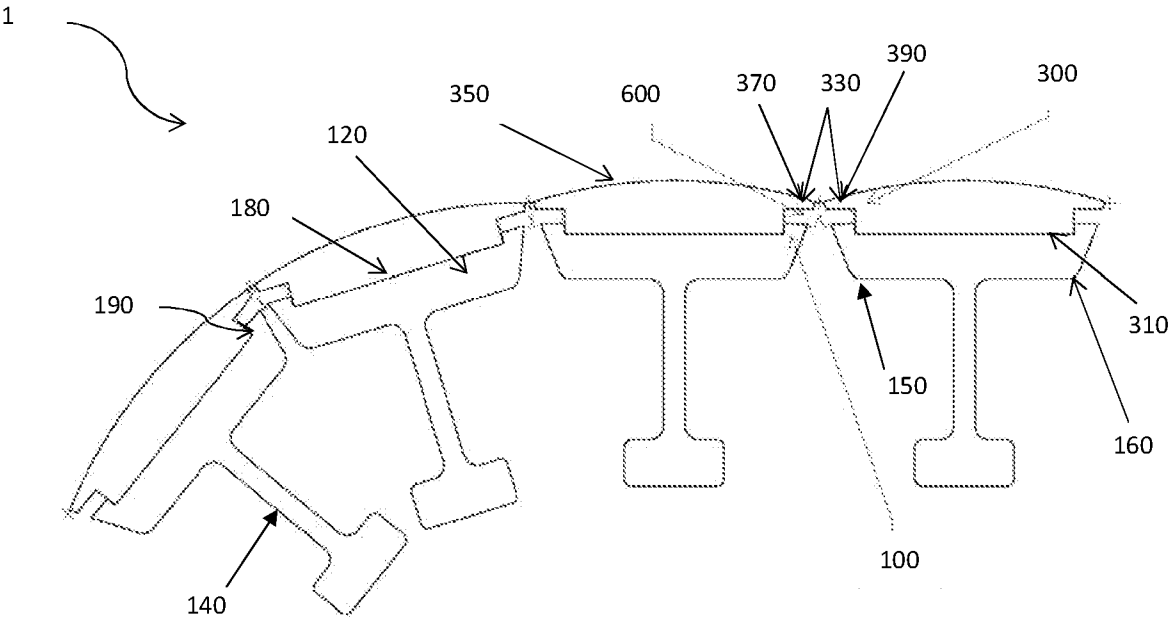


Fig. 2

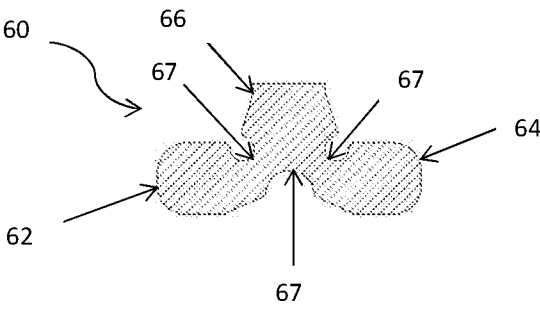


Fig. 3a

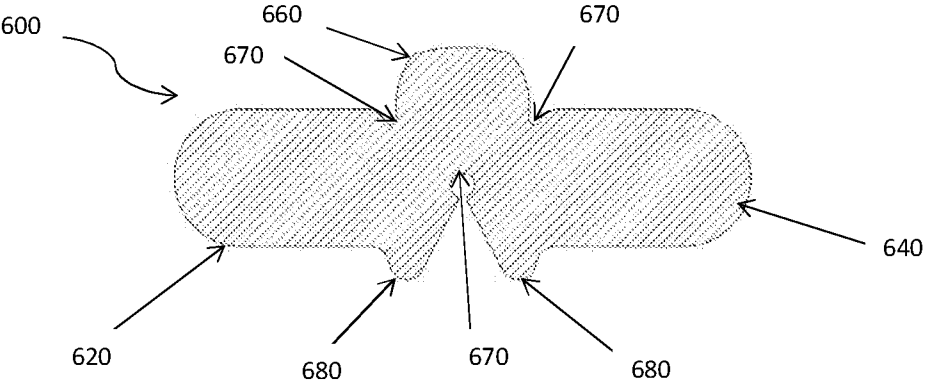


Fig. 3b

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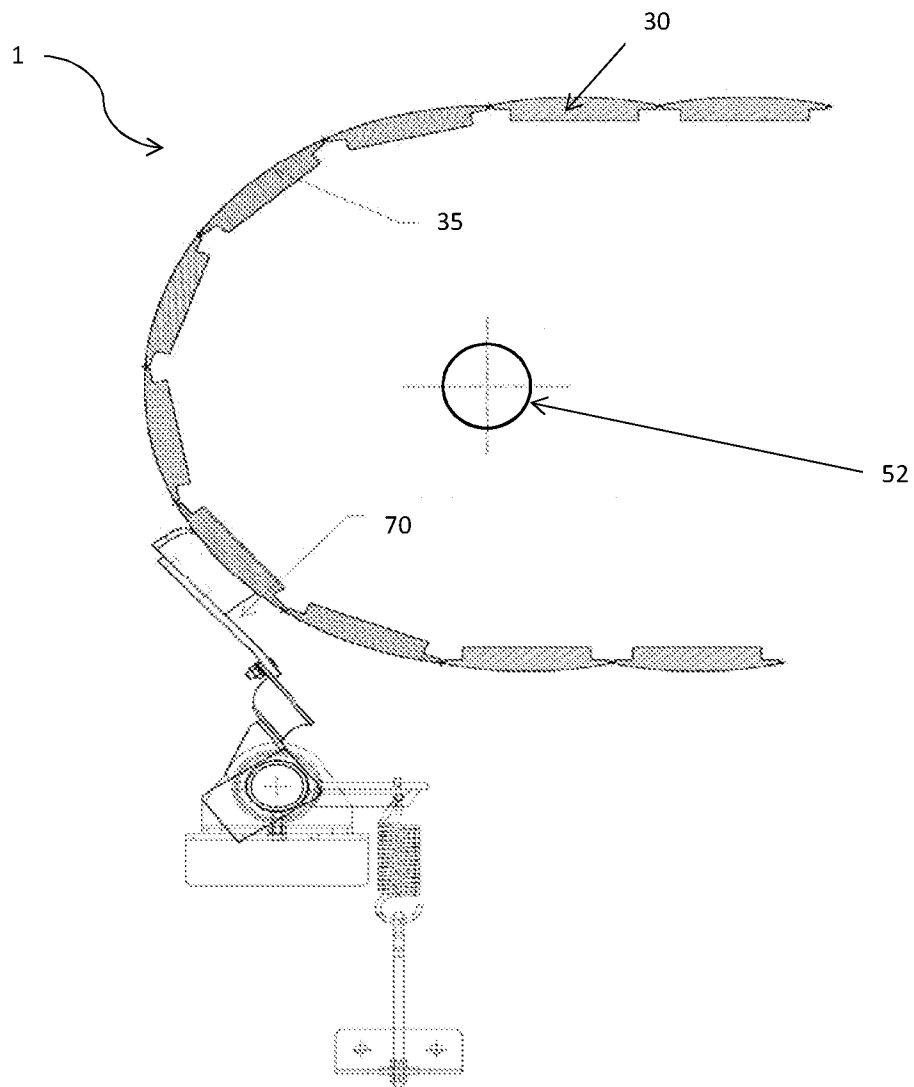


Fig. 4

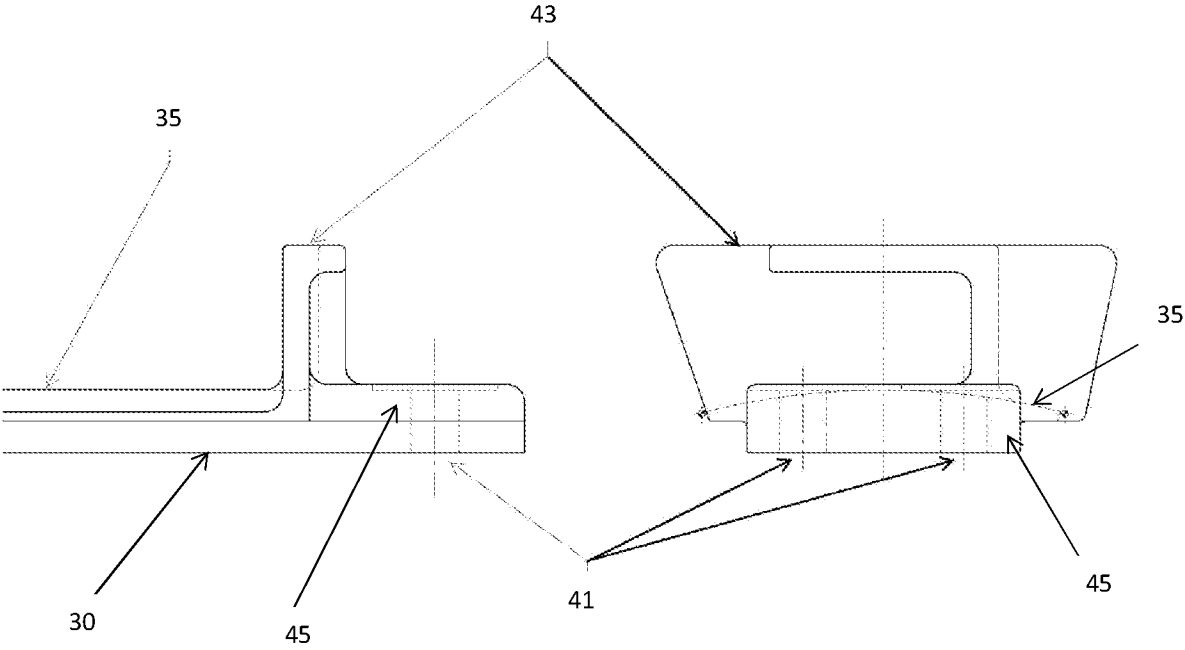


Fig. 5a

Fig. 5b

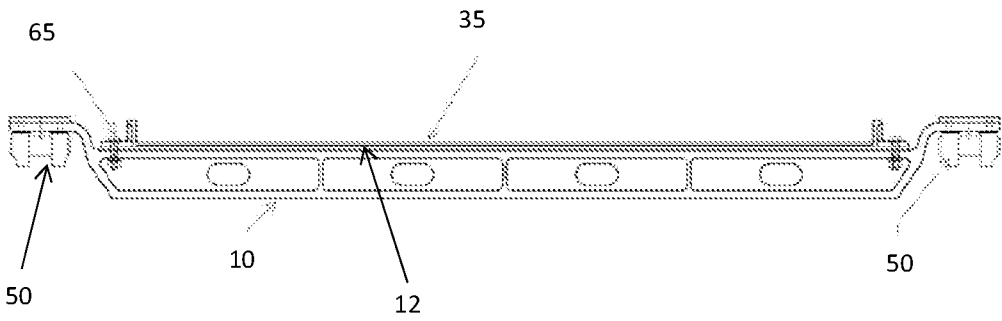


Fig. 6

INTERNATIONAL SEARCH REPORT

 International application No.
PCT/AU2019/051047

A. CLASSIFICATION OF SUBJECT MATTER

B65G 17/06 (2006.01) B65G 17/30 (2006.01) B65G 17/34 (2006.01) B65G 17/10 (2006.01) B65G 45/12 (2006.01)
B65G 25/04 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

Databases: PATENW, AusPat, Espacenet, Google Patents, Google

IPC/CPC Symbols: B65G17/065 B65G17/067 B65G17/30 B65G17/34 B65G17/10 B65G17/06 B65G2201/045 B65G45/12B65G25/04

Keywords: conveyor, seal, debris, prevent, rib, rubber, scraper and similar terms

Applicant name also searched on Espacenet, AusPat and internal databases provided by IP Australia.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Documents are listed in the continuation of Box C	



Further documents are listed in the continuation of Box C



See patent family annex

* "A" "D" "E" "L" "O" "P"	Special categories of cited documents: document defining the general state of the art which is not considered to be of particular relevance document cited by the applicant in the international application earlier application or patent but published on or after the international filing date 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) document referring to an oral disclosure, use, exhibition or other means document published prior to the international filing date but later than the priority date claimed	"T" "X" "Y" "&"	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 document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone 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 document member of the same patent family
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Date of the actual completion of the international search 20 December 2019	Date of mailing of the international search report 20 December 2019
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA Email address: pct@ipaustalia.gov.au	Authorised officer Alex Stone AUSTRALIAN PATENT OFFICE (ISO 9001 Quality Certified Service) Telephone No. +61262832643

INTERNATIONAL SEARCH REPORT		International application No.
C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		PCT/AU2019/051047
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2015124089 A (RAISEN CO LTD) 06 July 2015 Abstract, figures 1-4 and description paragraphs [0001-0006]	1-7
X	WO 2004/092042 A1 (INTELLIGRATED INC) 28 October 2004 Abstract, figures 1-7 and 17-28 and paragraphs [0037-0054]	1-7
X	US 3202266 A (ALFRED SCHMERMUND) 24 August 1965 Figures 1-7 and description columns 1 and 2	1
X	GB 1411071 A (KLESSMANN IMA NORTE MASCHFAB) 22 October 1975 Figures 1 and description page 2 columns 1 and 2	1
A	US 20120211333 A1 (LUTZ) 23 August 2012	

INTERNATIONAL SEARCH REPORT		International application No.	
Information on patent family members		PCT/AU2019/051047	
This Annex lists known 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/s Cited in Search Report		Patent Family Member/s	
Publication Number	Publication Date	Publication Number	Publication Date
JP 2015124089 A	06 July 2015	JP 2015124089 A	06 Jul 2015
WO 2004/092042 A1	28 October 2004	WO 2004092042 A1	28 Oct 2004
		BR PI0407312 A	10 Jan 2006
		BR PI0407312 B1	21 Feb 2017
		CA 2515103 A1	28 Oct 2004
		CN 1756705 A	05 Apr 2006
		CN 1756705 B	16 Jun 2010
		EP 1592631 A1	09 Nov 2005
		EP 1592631 B1	29 Aug 2007
		JP 2006519744 A	31 Aug 2006
		KR 20050107414 A	11 Nov 2005
		KR 101033410 B1	09 May 2011
		MX PA05008361 A	28 Feb 2006
		US 6860376 B1	01 Mar 2005
		US 2005284730 A1	29 Dec 2005
		US 7441646 B2	28 Oct 2008
		US 2009032374 A1	05 Feb 2009
		US 7857116 B2	28 Dec 2010
US 3202266 A	24 August 1965	US 3202266 A	24 Aug 1965
		CH 406014 A	15 Jan 1966
		DE 1183014 B	03 Dec 1964
		FR 1335520 A	23 Aug 1963
		GB 931359 A	17 Jul 1963
GB 1411071 A	22 October 1975	GB 1411071 A	22 Oct 1975
		ES 426421 A1	01 Jul 1976
		IT 1013294 B	30 Mar 1977
US 20120211333 A1	23 August 2012	US 2012211333 A1	23 Aug 2012
End of Annex			
Due to data integration issues this family listing may not include 10 digit Australian applications filed since May 2001.			