Cleaning apparatus (1) includes a tubular device (2) which has a longitudinally extending slot (3) and input orifices (4 and 5) at opposite ends of the device. Screw threaded regions (6 and 7) of the tube (2) are arranged to allow respective hose connectors (8 and 9) of a supply hose (10) to be sealingly connected to respective ends of the device (2). The supply hose (10) has arms (11, 12) which emanate from a common source supply region (13) which, in turn, is connected in use to a fluid supply means (14). The fluid supply means (14) is preferably arranged to supply high pressure air to the device. The apparatus (1) is fixed adjacent to a load carrying surface of a conveyor with the slot (3) being disposed such that air flowing out thereof is directed at the load carrying surface. In use, the supply means is caused to supply air at high pressure through each arm of the supply hose (10) and, in turn, air flows through the input orifices (4, 5). Subsequently air flows out of the output orifice towards the load carrying surface of the conveyor and debris is removed thereby.
DESIGNATIONS OF "SU"

Any designation of "SU" has effect in the Russian Federation. It is not yet known whether any such designation has effect in other States of the former Soviet Union.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

<table>
<thead>
<tr>
<th>AT</th>
<th>Austria</th>
<th>ES</th>
<th>Spain</th>
<th>MG</th>
<th>Madagascar</th>
</tr>
</thead>
<tbody>
<tr>
<td>AU</td>
<td>Australia</td>
<td>FI</td>
<td>Finland</td>
<td>ML</td>
<td>Mali</td>
</tr>
<tr>
<td>BB</td>
<td>Barbados</td>
<td>FR</td>
<td>France</td>
<td>MN</td>
<td>Mongolia</td>
</tr>
<tr>
<td>BE</td>
<td>Belgium</td>
<td>GA</td>
<td>Gabon</td>
<td>MR</td>
<td>Mauritania</td>
</tr>
<tr>
<td>BF</td>
<td>Burkina Faso</td>
<td>GB</td>
<td>United Kingdom</td>
<td>MW</td>
<td>Malawi</td>
</tr>
<tr>
<td>BG</td>
<td>Bulgaria</td>
<td>GN</td>
<td>Guinea</td>
<td>NL</td>
<td>Netherlands</td>
</tr>
<tr>
<td>BJ</td>
<td>Benin</td>
<td>GR</td>
<td>Greece</td>
<td>NO</td>
<td>Norway</td>
</tr>
<tr>
<td>BR</td>
<td>Brazil</td>
<td>HU</td>
<td>Hungary</td>
<td>PL</td>
<td>Poland</td>
</tr>
<tr>
<td>CA</td>
<td>Canada</td>
<td>IT</td>
<td>Italy</td>
<td>RO</td>
<td>Romania</td>
</tr>
<tr>
<td>CF</td>
<td>Central African Republic</td>
<td>JP</td>
<td>Japan</td>
<td>SD</td>
<td>Sudan</td>
</tr>
<tr>
<td>CG</td>
<td>Congo</td>
<td>KP</td>
<td>Democratic People's Republic of Korea</td>
<td>SE</td>
<td>Sweden</td>
</tr>
<tr>
<td>CH</td>
<td>Switzerland</td>
<td>KR</td>
<td>Republic of Korea</td>
<td>SN</td>
<td>Senegal</td>
</tr>
<tr>
<td>CI</td>
<td>Côte d'Ivoire</td>
<td>LI</td>
<td>Liechtenstein</td>
<td>SU</td>
<td>Soviet Union</td>
</tr>
<tr>
<td>CM</td>
<td>Cameroon</td>
<td>LK</td>
<td>Sri Lanka</td>
<td>TD</td>
<td>Chad</td>
</tr>
<tr>
<td>CS</td>
<td>Czechoslovakia</td>
<td>LU</td>
<td>Luxembourg</td>
<td>TG</td>
<td>Togo</td>
</tr>
<tr>
<td>DE</td>
<td>Germany</td>
<td>MC</td>
<td>Monaco</td>
<td>US</td>
<td>United States of America</td>
</tr>
<tr>
<td>DK</td>
<td>Denmark</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CLEANING APPARATUS AND METHODS

This invention relates to cleaning apparatus, and is concerned particularly, although not exclusively, with the cleaning of conveying surfaces of endless conveyors.

Endless conveyors such as belt conveyors are used extensively in industry for moving materials from one place to another. For example, in the mining industry conveyors are much in evidence both underground and above ground, being used for transporting, amongst other things, mined materials. In the confectionery industry, extensive use of conveyors is also evident for transporting, for example, sweets or toffees from the place of manufacture to packaging machines.

In order that the various industries which utilise conveyors may perform efficiently, it will be appreciated that it is important that the conveyors, and in particular, the conveying surfaces thereof, are kept generally clean.

When mining materials, such as coal, are being transported on conveyors, coal dust and pieces of coal tend to adhere to the surface of the conveyor causing inefficiency and an increased potential for the conveyor to become clogged up. In the confectionery industry, where cleanliness is of paramount importance, it will be appreciated that, for reasons of both efficiency and cleanliness, material adhering to the conveyor surface will need to be removed.

Known means for removing material from conveyor surfaces includes the provision of scrapers. Scrapers may be blade-like members which are positioned so as to contact the surface of the conveyor belt in order to scrape it clean. However, there may be various disadvantages with such scrapers. For example, the
scrapers may gradually wear down the conveyor surface being scrapped due to frictional contact between the scrapers and the surface. Also, scrapers tend to be inefficient when cleaning an undulating conveyor surface, as, in such a case, the scrapers tend only to contact the surface at peaks of the undulations.

In order to clean more efficiently undulating conveyor surfaces, spring loaded scrapers have been used. These scrapers are urged towards the conveyor surface by a spring or a torsional force. However, it will be appreciated that the presence of the force tends to increase the wear on the surface, particularly at peaks of the uneven surface, where the frictional force between the scrapers and the surface will be greatest.

We aim to improve upon this situation by providing apparatus and methods which may alleviate the aforementioned problems.

According to the present invention, there is provided a conveyor apparatus comprising an endless conveyor and a cleaning device disposed adjacent a load carrying surface of the conveyor, the device having a first input orifice to receive a pressure fluid and, communicating therewith, an output orifice which is provided in a wall of the device and is disposed adjacent said load carrying surface so as to direct said pressure fluid, in use, onto said surface, thereby to clean said surface.

The conveyor may be, for example a belt conveyor or chain conveyor.

The invention extends to a cleaning device for location adjacent a load carrying surface of a conveyor,
the device having a first input orifice for receiving a pressure fluid and, communicating therewith, an output orifice provided in a wall of the device for directing the pressure fluid, in use, on to a load carrying surface of a conveyor in order to clean the surface.

Preferably, said output orifice of the cleaning device comprises a slot. The slot may have length in the range 0.4 metres to 3.5 metres. Alternatively and/or additionally, though less preferred, said output orifice may comprise a plurality of substantially circular or elliptical apertures.

Preferably, the cleaning device is elongate, and said wall extends longitudinally of the device. Preferably, the device is of substantially constant cross-section.

The output orifice may extend along substantially the whole length of said device. Preferably, the length of the output orifice is such that it extends, in use, substantially across the width of a load carrying surface of the or an endless conveyor. Preferably, the length of the output orifice is such that it extends, across the width, to within 0-0.1 metres, more preferably 0.05 metres, of both edges of the load carrying surface. The output orifice may be substantially rectangular in plan view. Preferably, the output orifice has a width in the range 0.5 mm to 5 mm. Preferably, the dimensions of the output orifice are fixed and non-adjustable.

Preferably, said first input orifice is provided in a transverse wall of said device.

Preferably, the device is arranged such that, in use, the pressure of fluid flowing out of the output orifice is
greater in a central region of the orifice. Thus, in use, a pressure fluid may be directed at a central region of a load carrying surface with the greatest force. Preferably, the device is arranged such that, in use; the pressure of fluid flowing out of the orifice is less the greater the distance away from the central region of the orifice, as measured along the orifice. Preferably, the pressure of fluid flowing out of the orifice gradually falls off in dependence upon the distance along the orifice from the central region thereof.

Preferably, the device includes two input orifices, preferably, provided at or adjacent opposite ends of said device. Preferably, the input orifices are of equal cross-sectional area. When two such input orifices are provided, the pressure of fluid flowing out of the output orifice is greatest in a central region of the orifice and it then falls away in dependence upon the distance, measured along the orifice, from the central region.

Preferably, said output orifice of said device, in use, directs said pressure fluid in a direction substantially perpendicular to the general direction in which fluid travels within the device. Additionally, preferably, said output orifice of said device, in use, directs said pressure fluid in a direction substantially perpendicular to the direction from which fluid is input into the device.

Preferably, the apparatus includes a fluid supply means adapted to supply fluid to the device. Preferably, said first input orifice is connected to said fluid supply means. Said two input orifices when provided may be connected to the same fluid supply means.
Preferably, the device includes a connector means for connecting a fluid supply means to the or each input orifice so as to allow passage of fluid between the fluid supply means and the or each input orifice. In a preferred embodiment, the connector means comprises a bifurcated connector means, a main branch of which is arranged to be connected to a fluid supply means and two sub-branches of which are arranged to be connected to a respective one of said two input orifices.

Preferably, the cross-sectional area of the first input orifice is equal to or greater than the cross-sectional area of the output orifice. Preferably, when provided, the sum of the cross-sectional areas of the input orifices is greater than the cross-sectional area of the output orifice.

When the device includes a bifurcated connector means, it is preferred that the cross-sectional area of the main branch thereof is equal to, preferably greater than, the cross-sectional area of the output orifice.

Said fluid supply means may be adapted to supply a fluid which is a gas at room temperature and pressure, the fluid being selected from the group comprising compressed air, nitrogen, oxygen, carbon-dioxide, sulphur dioxide and noble gases.

Alternatively and/or additionally, said fluid supply means may be adapted to supply a fluid which is a liquid at room temperature and pressure, the fluid being selected from the group comprising water, carbon tetrachloride and carbon disulphide. Alternatively and/or additionally, said fluid supply means may be adapted to supply steam.
Preferably, said fluid supply means may be adapted to supply said fluid at a pressure in the range 50 to 3,000 p.s.i. Said fluid supply means may be adapted to supply fluid at a pressure in the range 1,000 to 2,000 p.s.i. Said fluid supply means may be adapted to supply fluid at a pressure in the range 1,500 to 1,700 p.s.i.

Preferably, said fluid supply means is adapted to supply a percussion fluid— that is, a high frequency pulsing fluid. Preferably, said fluid supply means is adapted to cause a percussion effect on the fluid. Preferably, said fluid supply means is a percussion operated fluid line.

Preferably, the device is provided adjacent an underside part of said conveyor. Alternatively and/or additionally a said device may be provided adjacent an upper part of said conveyor. A plurality of devices may be provided at suitable locations. The device may be adapted to direct the pressure fluid at the conveyor at an angle of incidence in the range of 30° to 90° to the plane of the surface of the conveyor. Preferably, the device has a length in the range of 0.4 to 3.5 metres and a cross-sectional width in the range 15 mm to 75 mm.

Said device may be made substantially of stainless steel, plastics or any suitable material. Preferably, it is made substantially of stainless steel. Preferably, said device is a tube. Said fluid supply means may be connected to said device by means of rubber hose(s) arranged as described above.

The invention extends to a method of cleaning a load carrying surface of an endless conveyor using a cleaning device having a first input orifice to receive a pressure
fluid and, communicating therewith, an output orifice which is provided in a wall of the device and is disposed adjacent said load carrying surface so as to direct said pressure fluid, in use, onto said surface, thereby to clean said surface.

Preferably, the method includes securing a cleaning device as described in any statement herein adjacent the load carrying surface of the conveyor, the method further including:

supplying fluid to said device, the fluid having a pressure in the range 50 to 2,000 p.s.i; and

directing fluid output from said output orifice of said device at the surface of the conveyor in order to clean the surface thereof.

The method may include the step of supplying a percussive fluid to said device. Preferably, the method includes the step of causing the load carrying surface of the conveyor to percuss in a region adjacent to said device.

The invention further extends to a method of converting an existing conveyor installation, including the step of securing a cleaning device as described in any statement herein adjacent to a load carrying surface of an endless conveyor to provide a conveyor apparatus as described herein.

For a better understanding of the invention, and to show how same may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:
Figure 1 is a schematic view of a cleaning device;

Figure 2, 3, 4, 5, 6 and 7 are plan views of alternative cleaning tubes;

Figure 8 is a side elevation of a conveyor apparatus; and

Figure 9 is a side elevation of part of a conveyor apparatus.

The cleaning apparatus 1 shown in Figure 1 includes a tubular device 2 which has a longitudinally extending slot 3 and input orifices 4 and 5.

At each end of the tube 2, adjacent respective orifices 4 and 5, there are provided screw threaded regions 6 and 7. The screw threaded regions 6 and 7 are adapted to be sealingly connected to respective hose connectors 8 and 9 of a supply hose 10.

The supply hose 10 has arms 11 and 12 which emanate from a common source supply region 13. The source supply region 13 is adapted to be connected to a fluid supply means 14.

The tube 2 may be substantially straight, as shown in Figure 1. It may be preferable to round the ends of the tube for ease of attachment to the hose connectors 8 and 9.

The slot 3 may be provided at any suitable position of the tube 2. Figure 1 shows the slot 2 extending almost the whole length of the tube. As an alternative to this,
the slot may only cover, for example, the middle third of the tube.

Other alternative tubes may be provided. For example, Figure 2 shows a tube 2 having two slots 3a and 3b of similar length. Figure 3 shows a tube having seven slots 3i to 3o. It will be appreciated, that any number of slots may be provided along the length of the tube as required for any particular application. As an alternative to a single line of slots, a plurality of longitudinally extending slots 3 may be provided parallel to one another as shown in Figures 4 and 5. As a further alternative, a plurality of drilled holes may be provided along the longitudinal extent of a tube.

Figure 6 shows an angular tube 40 having an angular slot 3. This tube 40 may be positioned with, for example, the plane which includes the slot 3 tilted relative to the plane of a belt surface to be cleaned. This may result, in use, in an optimum pressure force being directed towards the centre region of the belt surface in order to remove more effectively material from this region. This may be advantageous, as material tends to accumulate in the centre region of a belt.

As an alternative to the tube 40, an arcuate tube may be provided having an arcuate slot. In other respects this tube may be similar to the Figure 6 embodiment.

As a further alternative, a tube 60 (Figure 7) may be provided having an output orifice, such as a slot 61, disposed in the middle third of the tube. Again, in use, this may result in an optimum pressure force being directed towards the centre region of the belt surface.
In the figures it will be appreciated that the size of the slots is exaggerated for purposes of clarity.

In Figure 8, a conveyor 50, for example, a belt conveyor includes end rollers 51, 52 and feed rollers 53.

Cleaning apparatus 1 of the type described above is provided adjacent the roller 52. Tube 2 of the apparatus 1 is fixed in position so that it extends transversely to the direction of travel 61 of the conveyor 50. The tube 2 is preferably of similar width to the width of the belt 54.

The apparatus may operate as follows:

Material 60, such as coal, is carried in a direction shown by the arrow 61. When this reaches the roller 52 it falls off the end and is deposited in a suitable place (not shown). However, not all of the material may be displaced from the conveyor surface, some may adhere thereto, and if not removed, will tend to stick to the rollers 51, 52 and 53 and eventually clog up the conveyor.

The apparatus 1 is provided for removing some of the adhering debris.

Fluid, such as compressed air, is fed by the fluid supply means 14 through the region 13 and, in turn, through the hoses 11 and 12 before entering the tube 2. The only means of escape for the fluid from the tube is via the slot 3. The tube 2 and the slot 3 thereof are positioned so as to direct the fluid output therefrom onto the belt 54 so as to clean the belt surface.
Thus, the conveyor surface is cleaned by the impact of fluid on the surface. If, for example, the fluid is compressed air, the conveyor surface is cleaned effectively by blowing the debris from the surface.

The fluid may be directed at an angle of about 45° to the conveyor belt surface in order to have a levering effect on the debris carried on the surface. Alternatively, any other suitable angle of incidence of the fluid may be used. Debris removed from the conveyor surface may be directed to a convenient location for deposit.

In Figure 8, the apparatus 1 is shown to be located underneath the conveyor 50 just after the point at which some debris will fall off the belt under gravity. It will be appreciated that the apparatus 1 may be provided at any convenient location adjacent a belt surface. More particularly, it may be provided at a point generally indicated by arrow 60, this point 60 being the point where non-adhering debris falls off the conveyor under gravity.

Advantageously, means may be provided adjacent the cleaning apparatus in order to direct and/or receive debris which has been removed. In addition, it is preferable to enclose the apparatus 1 in order to collect debris and increase the safety of the apparatus by stopping, or at least reducing, the quantity of debris entering the atmosphere around the apparatus. It will be appreciated that as debris is removed it is likely to have a high velocity and accordingly it is preferable that personnel are protected from this.

In order to increase the efficiency of the cleaning of the belt 54, a plurality of apparatuses 1 may be
provided adjacent the belt in suitable positions. The choice as to how many of the apparatuses to provide adjacent a conveyor may depend on the material which is carried on the conveyor, and in particular, the extent to which this material adheres to the conveyor surface.

It will be appreciated also, that the pressure of fluid incident on a conveyor surface will determine to a large extent the efficiency with which debris is removed therefrom. In some cases, it is preferable to use a fluid pressure of about 1,600 psi. Such a pressure may be provided by any suitable means, though, apparatus operating on the percussion principle may be of particularly utility. More particularly, the fluid supply means 14 may be an air lance such as, for example, the Airnesco (Trade Mark) N1 percussion lance.

It may be particularly advantageous to use a fluid supply means which operates on the percussion principle.

Air at, for example, 80 psi may be input into a percussive supply means. Such a percussive supply means can effectively increase the pressure of fluid output from the supply means to, for example, 1600 psi. The output will be percussive, that is, it will consist of high frequency pulses of fluid. These high frequency high pressure pulses may 'blast' debris from a conveyor surface. Alternatively and/or additionally, it may be that the conveyor surface will oscillate at the high frequency so that debris will be removed by being shaken from the surface. Thus, it may be of utility to encourage oscillation of the surface to aid cleaning of the surface. The conveyor surface may alternatively be oscillated by independent means.
In order to increase efficiency of the apparatus 1, it is preferable to provide a tube 2 wherein the cross-sectional area of the orifices 4 and 5 is equal to, or greater than, the cross-sectional area of the slot 3. It is also preferable for the area in the region 30 of the source supply region 13 to be of substantially the same area as the input orifices 4 and 5, so as to minimise the variation in pressure in the apparatus 1. Also, it may be of utility for the diameters of hoses 11 and 12 to be less than the diameter of supply region 13.

The aforementioned apparatus and method may, besides aiding the removal of debris from a conveyor surface, dry out or remove moisture from wet belts. This may be particularly the case when, for example, the fluid used is compressed air. Also, as there is no direct mechanical contact between the apparatus and the surface of the conveyor belt, there may be little mechanical wear on the conveyor surface.

The apparatus may be advantageously fitted to existing belts without the need for extensive modifications thereof.

The apparatus may be used as the only means of cleaning conveyor surfaces. However, it should be noted that the apparatus may be used with existing cleaning apparatus to provide a combined apparatus. For example, in Figure 9 a conventional scraper 90 is provided in contact with a belt 93 to remove larger pieces of debris. In addition, a tube 91 is provided, to direct a pressure force at the point of contact 92 of the scraper with the belt 93.
It should be noted that any tube disclosed herein may be used in conjunction with any other tube disclosed herein and/or existing methods of removing debris depending on the particular requirements.

The apparatus and method may be used in almost any industry which utilises conveyors. For example, in the coal mining industry, coal dust and pieces of coal which adhere to conveyor surfaces may be removed. When situated underground, it may be preferable to use an inert gas such as nitrogen as the pressure fluid. This may reduce the chances of explosions occurring as might happen if oxygen or air were used.

When, for example, dough or biscuits are being conveyed, it will be necessary to use purer gases than when coal is being conveyed. Inert gases such as argon or neon may be of utility. The use of air may be acceptable. A quantity of a gas which has sterilisation properties may also be used, such as sulphur dioxide.

In some situations, for example, when removing organic soluble debris from a surface, it may be of use to use fluids such as carbon tetrachloride.

As mentioned above, more than one tube may be provided at any suitable position adjacent a conveyor surface. Different fluids may be fed into each of these tubes. These fluids may be directed at the conveyor at different pressures. Thus, a series of tubes may be provided at intervals adjacent a conveyor surface. For example, the first may output fluid at a pressure of 1,100 psi, the second may output fluid at 1,200 psi, the third may output fluid at 1,300 psi, etc.
In addition a greater number of tubes adapted to direct a pressure fluid towards the centre of a conveyor surface (where debris accumulation tends to be greatest) may be provided in order to aid debris removal in this region.

The aforementioned apparatus may conveniently be compact for ease of installation to almost any existing conveyors. If the fluid to be used is compressed air, the supply means (a compressor) may be disposed remotely relative to the cleaning apparatus. For example, the compressor may be provided substantially above (or below) a tube 3.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.
The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.
CLAIMS:

1. A conveyor apparatus comprising an endless conveyor and a cleaning device disposed adjacent a load carrying surface of the conveyor, the device having a first input orifice to receive a pressure fluid and, communicating therewith, an output orifice which is provided in a wall of the device and is disposed adjacent said load carrying surface so as to direct said pressure fluid, in use, onto said surface, thereby to clean said surface.

2. A cleaning device for location adjacent a load carrying surface of a conveyor, the device having a first input orifice for receiving a pressure fluid and, communicating therewith, an output orifice, provided in a wall of the device, for directing the pressure fluid, in use, on to a load carrying surface of a conveyor in order to clean the surface.

3. Apparatus or a device according to Claim 1 or Claim 2, wherein said output orifice comprises a slot.

4. Apparatus or a device according to any of the preceding claims, wherein the output orifice has a length in the range 0.4 metres to 3.5 metres.

5. Apparatus or a device according to any of the preceding claims, wherein the cleaning device is elongate, and said wall extends longitudinally of the device.

6. Apparatus or a device according to any of the preceding claims, wherein the device is of substantially constant cross-section.
7. Apparatus or a device according to any of the preceding claims, wherein the output orifice extends along substantially the whole length of said device.

8. Apparatus or a device according to any of the preceding claims, wherein the output orifice is substantially rectangular in plan view.

9. Apparatus or a device according to any of the preceding claims, wherein the dimensions of the output orifice are fixed and non-adjustable.

10. Apparatus or a device according to any of the preceding claims, wherein said first input orifice is provided in a transverse wall of said device.

11. Apparatus or a device according to any of the preceding claims, wherein the device is arranged such that, in use, the pressure of fluid flowing out of the output orifice is greatest in a central region of the orifice.

12. Apparatus or a device according to claim 11, wherein the device is arranged such that, in use, the pressure of fluid flowing out of the output orifice is less the greater the distance away from the central region of the orifice, as measured along the orifice.

13. Apparatus or a device according to any of the preceding claims, wherein the device includes two input orifices.

14. Apparatus or a device according to Claim 13, wherein said two input orifices are provided at or adjacent opposite ends of the device.
15. Apparatus or a device according to Claim 13 or 14, wherein the input orifices are of substantially equal cross-sectional area.

16. Apparatus or a device according to any of the preceding claims, wherein the cross-sectional area of first input orifice is equal to or greater than the cross-sectional area of the output orifice.

17. Apparatus or a device according to any of the preceding claims, wherein the device includes a connector means for connecting a fluid supply means to the or each input orifice so as to allow passage of fluid between the fluid supply means and the or each input orifice.

18. Apparatus or a device according to Claim 17, when dependent upon Claim 13 or 14, wherein the connector means comprises a bifurcated connector means, a main branch of which is arranged to be connected to a fluid supply means and two sub-branches of which are arranged to be connected to a respective one of said two input orifices.

19. Apparatus or a device according to any of the preceding claims, wherein said output orifice of said device, in use, directs said pressure fluid in a direction substantially perpendicular to the direction in which fluid is input into the device.

20. Apparatus or a device according to any of the preceding claims, the apparatus or the device including a fluid supply means adapted to supply fluid to the device.

21. Apparatus or a device according to any of Claims 13 to 20, when dependent upon Claim 13 or 14, wherein said
two input orifices are connected to the same fluid supply means.

22. Apparatus or a device according to Claim 20 or Claim 21, wherein said fluid supply means is adapted to supply a fluid which is a gas at room temperature and pressure.

23. Apparatus or a device according to any of Claims 20 to 22, wherein said fluid supply means is adapted to supply said fluid at a pressure in the range 50 to 2,000 p.s.i.

24. Apparatus or a device according to any of Claims 20 to 23, wherein said fluid supply means is adapted to supply a percussing fluid.

25. Apparatus or a device according to Claim 24, wherein said fluid supply means is a percussion operated fluid line.

26. Apparatus or a device according to any of the preceding claims, wherein the device has a length in the range 0.4 metres to 3.5 metres and the output orifice has a width in the range 0.5 mm to 5 mm.

27. A method of cleaning a load carrying surface of an endless conveyor, using a cleaning device having a first input orifice which receives a pressure fluid and an output orifice which is provided in a wall of the device and is disposed adjacent said load carrying surface so as to direct said pressure fluid onto said surface, thereby to clean said surface.

28. A method according to Claim 27, wherein said device is in accordance with any of Claims 2 to 26.
29. A method according to any of Claims 27 or 28, including the step of supplying a percussing fluid to said device.

30. A method according to any of Claims 28 to 29, including the step of causing the load carrying surface of the conveyor to percuss in a region adjacent to said device.

31. A method of converting an existing conveyor installation, including the step of securing a cleaning device according to any of Claims 2 to 26 adjacent to a load carrying surface of an endless conveyor to provide a conveyor apparatus according to any of Claims 1 and 3 to 26.
# INTERNATIONAL SEARCH REPORT

**International Application N°** PCT/GB 91/01508

## I. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both National Classification and IPC

<table>
<thead>
<tr>
<th>Int.Cl.</th>
<th>Classification Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>B65G</td>
</tr>
</tbody>
</table>

## II. FIELDS SEARCHED

Minimum Documentation Search conducted to the Extent that such Documents are Included in the Fields Searched

### Classification System

<table>
<thead>
<tr>
<th>Classification Symbols</th>
</tr>
</thead>
<tbody>
<tr>
<td>B65G</td>
</tr>
</tbody>
</table>

Documentation Search other than Minimum Documentation conducted to the Extent that such Documents are Included in the Fields Searched

## III. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of Document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to Claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>US,A,3 970 192 (CARL VON WOLFFRADT) 20 July 1976</td>
<td>1-3,5,8, 10,17, 19,20, 22,27, 28,31</td>
</tr>
<tr>
<td></td>
<td>see the whole document</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>DE,A,2 944 340 (ERKELENZER MASCHINENFABRIK FERD. CLASEN) 14 May 1981</td>
<td>1-3,5,6, 7,23,27, 28,31</td>
</tr>
<tr>
<td></td>
<td>see the whole document</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>FR,A,2 286 080 (MASCIA) 23 April 1976</td>
<td>1-3,5,6, 7,8,9, 27,28,31</td>
</tr>
<tr>
<td></td>
<td>see the whole document</td>
<td></td>
</tr>
</tbody>
</table>

* Special categories of cited documents:
- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another invention or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "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
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step
- "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
- "A" document member of the same patent family

## IV. CERTIFICATION

**Date of the Actual Cor.** of the International Search

04 **DECEMBER 1991**

**International Searching Authority**

EUROPEAN PATENT OFFICE

**Date of Mailing of this International Search Report**

13 **12, 91**

**Signature of Authorized Officer**

OSTYN T.J.M.
This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 04/12/91. The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td>US-A-3970192</td>
<td>20-07-76</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>DE-A-2944340</td>
<td>14-05-81</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>FR-A-2286080</td>
<td>23-04-76</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

For more details about this annex: see Official Journal of the European Patent Office, No. 12/82.