CONVENTION APPLICATION FOR A PATENT

We, TBA INDUSTRIAL PRODUCTS LIMITED, a Company organized under the laws of Great Britain, of 20 St. Mary's Parsonage, Manchester, M3 2NL, England, hereby apply for the grant of a patent for an invention entitled, GLASS FIBRE PRODUCTS, which is described in the accompanying complete specification.

This application is a Convention Application and is based on the application for a patent or similar protection made in the United Kingdom, on 18 November 1983, numbered 83 30799, and in the United Kingdom, on 18 November 1983, numbered 83 30800, and in the United Kingdom, on 18 November 1983, numbered 83 30801.

Our address for service is: Care of JAMES M. LAWRIE & CO., Patent Attorneys, of 72 Wilsomere Road, Kew, 3101, Victoria, Australia.

DATED this 9 day of November 1984.

JAMES M. LAWRIE & CO.

by:

Patent Attorneys for TBA INDUSTRIAL PRODUCTS LIMITED

To: The Commissioner of Patents

COMMONWEALTH OF AUSTRALIA
Declaration in Support of an Application for a Patent

Classified Form - Convention and Non-convention

In support of the Convention application made for a Patent in a Convention country in respect of an invention entitled Glass Fibre Products.

Robert Franklin Hadfield
PO Box 20, Ashburton Road West, Trafford Park
Manchester, M17 1BA, England.

Do solemnly and sincerely declare as follows:

1. I am authorised by TBA Industrial Products Limited, the applicant for the Patent, to make this declaration on behalf of the applicant.

2. The basic application(s) as defined by section 141 of the Act were made in the United Kingdom on the 18 day of November 1983 by TBA Industrial Products Limited, and on the 18 day of November 1983 by TBA Industrial Products Limited, and on the 18 day of November 1983 by TBA Industrial Products Limited, respectively.


4. The basic application(s) referred to in paragraph 2 of this Declaration were the first application(s) made in a Convention country in respect of the invention the subject of the application.

DECLARED AT Manchester this 3rd day of November 1984.

R F Hadfield
Authorised Signatory.

To: The Commissioner of Patents.
DOCUMENTS LODGED WITH THIS APPLICATION ARE UNSUITABLE FOR REPRODUCTION AND MAY BE INSPECTED AT THE PATENT OFFICE A.C.T.
A process for filling an automotive silencer casing with glass fibres characterised by the steps of presenting oppositely directed open ends of the casing substantially simultaneously to glass fibre feeding stations and filling the casing from both ends thereof.

the casing from inside the spacer element 13. After such a packing operation, the tube 17 will not normally require further support; the silencer casing, the tube and
P/00/011

PATENT ACT 1962–1973

COMPLETE SPECIFICATION

(ORIGINAL)

FOR OFFICE USE

Class:
Int. Cl:

Application Number:
Lodged:

Complete Specification—Lodged:
Accepted:
Published:

Priority:

Related Art:

TO BE COMPLETED BY APPLICANT

Name of Applicant: TBA INDUSTRIAL PRODUCTS LIMITED, a Company organized under the laws of Great Britain, of 20 St. Mary's Parsonage, Manchester, M3 2NL, England.

Address of Applicant:

Actual Inventors: KEITH BROADBELT, DAVID CATTERMOLE and RALPH HUGGETT

Address for Service: Care of: JAMES M. LAWRIE & CO., Patent Attorneys, of 72 Willsmere Road, Kew, 3101, Victoria, Australia

Complete Specification for the invention entitled: GLASS FIBRE PRODUCTS

The following statement is a full description of this invention, including the best method of performing it known to me:

*Note: The description is to be typed in double spacing, pica type face, in an area not exceeding 250 mm in depth and 160 mm in width, on tough white paper of good quality and it is to be inserted inside this form.
Glass Fibre Products

Technological Background.

Glass and/or mineral fibres are widely used for thermal and/or acoustic insulation. In the case of glass fibres it is common practice to chop continuous filament material into short lengths (staple fibres), thereafter forming a mat from the staple fibres produced, or simply packing the staple fibres into a supporting member. Thus stable fibres are packed into automotive silencer casings, into cavity walls, or are incorporated into sandwich panels for use in building construction.

The mechanical chopping of glass filaments into staple requires high speed rotating machinery; it may also expose workers to the physiological effects of staple fibres which are usually harsh, spiky and abrasive. In the case of automotive silencer casings the handling of staple glass fibres is a particular problem. It is difficult to accurately meter loose fibres entrained in an airstream, which is the usual mode of fibre transfer, especially where only a limited time is available to fill each casing, as on an automated production line for silencers.
Brief Discussion of the Prior Art

It is well known that a continuous glass fibre roving or sliver can be bulked by exposure to a highly turbulent airstream prior to deposition in a container as a fleece without breaking the filaments. It has been proposed in EP-A-0091413 that this fleece should be used to fill automotive silencer casings with bulked, continuous filament glass fibres, using suction applied through the casing to effect deposition of the appropriate quantity of glass fibre.

The process just described employs a conventional textile bulking or texturing jet as a means of exposing a continuous filament roving to the action of a highly turbulent airstream. It also uses a separate cutter device operable to sever the roving on completion of each silencer filling operation.

Common to known processes for filling silencer casings with glass fibres is the problem of achieving uniform bulk density of the filled material. As the casing fills up it is progressively more difficult for air to escape through the fibrous mass, even using suction and an/or an auxiliary airflow. Also, the material is both very bulky and very resilient, so it tends to spring back towards the outlet of the bulking jet. This progressively affects the quality of the bulking operation; it eventually slows down the rate of delivery from the jet, by virtue of progressively occluding the jet outlet. It also results in the last material supplied to a casing being of significantly lower bulk density than the first material supplied, to the point where it is even impossible to transfer the filled...
casing to further processing stages such as the installation end caps, because the filled material tends to overflow out of the end of the casing.

EP-A-0091413 discloses a process for filling a silencer casing, but only from one open end thereof. Such a process is effective for roughly half of the commonly used types of absorptive silencer. There are however other very commonly used types of absorptive silencer where the process just referred to is ineffective and/or inefficient. For example there are "straight-through" silencers, the automated production of which includes the step of fitting both end caps at once. For these, it is normal to use a glass fibre preform made in situ around a length of perforated exhaust gas duct to locate the latter duct inside the casing prior to affixing the end caps. Preform manufacture is an essential, extra step in this particular process. There are also silencers which have two separate fibre-filled absorptive regions either side of a reactive element comprising baffles in an intermediate fibre free volume. The absorptive regions may be of different shapes and/or sizes, but once again it is normal to fit both end closures at the same time. It is an object of the present invention to provide an improved process and apparatus for filling a silencer casing with glass fibres.

Brief Description of the Invention.

According to the present invention a process for filling a silencer casing with glass fibres is characterised by the steps of presenting oppositely directed open ends of the casing substantially simultaneously to glass fibre feeding stations and filling the casing from both ends thereof. Subsequently closures are affixed to said ends, preferably simultaneously.
Preferred Aspects of the Invention.

Preferably the process includes the steps of feeding continuous filament glass fibre roving to each feeding station and converting the roving to relatively bulky form prior to filling the casing with it. The roving may also be cut into staple prior to bulking, but preferably it remains in continuous filament form throughout the process.

The roving is preferably converted to relatively bulky form by the step of subjecting it to an air treatment in a known bulking jet. More preferably, however, the air treatment is carried out by causing the roving to pass through a bulking jet having novel constructional features, which will be discussed in detail later in this specification.

The process of the invention is preferably further characterised by the step of temporarily locating one end of a tubular spacer element on each open end of the casing prior to the filling step. Advantageously the filling step is in this particular instance carried out until an overflow or excess of fibres has been deposited in the spacer element and this is then followed by the further step of pushing the overflow from the spacer elements into the casing prior to removing the spacer element and subsequently affixing the closures to the ends of the casing.

The use of a spacer element effectively increases the volume to be filled, so that not only is any overflow completely contained within the spacer element, but by pushing the overflow out of the spacer element into the
organ, the end effector is moved to a position where a uniform cut can be made. This is typically done by
using a positioning stage that can control the quantity and
position of the cut. The end effector then operates

Filling was similarly performed with a fill rate
under the control of the controller, and under
such the next step.

Where filling of the perforations with an unsupported porous
straight-through filament is performed, the solution should be
turbulence prevented, and in terms of time, location and
radially and increased. The volume of the liquid
there is sufficient input, the temperature is

Apparatus Features and Use.

According to the method, the apparatus is to be
for filling a filament core. A radial feeding
feeding solution into the core is performed, and
is directed into the core at a suitable angle and
substantially at a rate that prevents solution
from filling the core to a significant extent. The
solution is then allowed to deposit in the core
and to cause the growth of the filament.

Each feeding station and its associated core is fed
Together with individual feeding, the core for such jet,
the jet being applied to cause the
cross-sectional shape and volume of the capsule to be
filled.
According to a particularly preferred feature of the present invention a bulking jet comprises a moving entry passageway, an airstream entry passageway and means for distributing the airstream evenly around the jet of an essentially annular sheet in the region of contact there-between, together with a common outlet passageway for the airstream and jetting, characterized in that the flow restriction due to that area of the jet having a said sheet immediately prior to said region of contact is significantly less than that due to the common outlet passageway. It will be understood that the latter restriction is referred to the outlet passageways in use, that is in the presence of both air and glue. The bulking jet is described above.

The effect is that the throughput of air is similarly restricted by the means for forming the jet in the annular sheet around the moving. Instead, the common outlet passageway now becomes a very efficient element.

It has been found that in the present method of bulking continuous filament glass fiber under the conditions for forming abrasive filament earlier outlined, the length to diameter ratio of the continuous, parallel sided, crosswise outlet passageway should be in the range 5 to 10, with a ratio of 6 being especially preferred. With typical moving mandrel speeds of at least 500 meter/minute being required to achieve high speed filling of filament coatings in a production line basis, the construction of the bulking jet has been found to have very significant effect on the efficiency of the process, to the extent that conventional textile bulking/texturing jets are unsatisfactory in comparison with a jet according to this invention.

5. The process of any preceding claims further characterized by the step of forming coating in a web, layer or sheet, characterized in that the bulking jet is a common outlet passageway.
because the description of the character is not clear.

passage: A character is moving in the passage. The character is moving in the moving in the passage. The character is moving in the passage.

founding: The character is moving in the passage. The character is moving in the passage.

any external interaction: The character is moving in the passage. The character is moving in the passage.

It has been suggested that the character is moving in the passage. The character is moving in the passage.

in the final analysis, the character is moving in the passage. The character is moving in the passage.

The character is moving in the passage. The character is moving in the passage.

To summarize, the character is moving in the passage. The character is moving in the passage.
It has been found that the use of a jet of low Iodine No. free air stream in a high velocity jet
by using an initial total Mach number of 2 or more
ratios of the Mach Number in the jet,
particularly for subsonic gas velocities, the devicel
reduces the tendency of the boundary layer at the jet.

Common to many alloy steels, the use of this invention in the area of minimum the frictional force
on small flowing in the area of minimum resultant
the jet. This invention is made very practical by the
fact that a minimum filling of a substance in a
resulting in high temperature material. In addition,
tesin, the desired fluid can be obtained. This is a virtue
the area of minimum time and cost. In addition,
desired, the desired fluid can be obtained. 
A coat should be made of the desired fluid, the
substance can be obtained. This is a virtue in the area of
development work. In addition, the
area. This invention is made very practical by the
flattening the fluid. In addition, the
stopped for development. In addition, the
use an electromagnet force, a material of the
slab/plate that can be obtained. The desired
characteristics can be obtained in this
... tension changes in the fluid where they
significant factor.
Whilst the use of such materials as glass or plastic in the manufacture of silencers is not new, and whilst in some cases, it will be understood that such materials are not entirely free from the presence of any foreign matter, the subsequent insertion of such materials may cause unforeseen trouble, and hence the necessity for the employment of resilient materials. Where the materials are readily bent themselves to accommodate different sections by reason of their shape and the resultant compaction.

Further aspects of the preferred silencer construction will be described later, with reference to the actual apparatus.

The apparatus preferably includes a resilient spacer element associated with each terminal element. Together with means for preventing dust entry of the silencer, the latter end of the terminal element is constructed of resilient material, the detailed construction of the terminal element itself. The apparatus includes means for operating to pass the terminal element through the spacer element into the silencer element, the outer side of the latter to operate to pass the terminal element into the tube thereto.

The volume of the spacer element is not critical, but it is preferred that its volume shall be about 10% of that of the silencer element itself. Above the spacer element is of similar constructional shape to the silencer casing to be filled. It is also desirable that it should have a resilient facing on that section which is in use to be abutted against the terminal element. This is useful to minimize both the leakage and misalignment problem. It will be appreciated that the actual
cross-sectional character of the present invention.

silencer mounting, the mounting being situated on the
equally well with the conventional elements of such
sections and members of the apparatus includes.

Where there is an apparatus comprising a particular type of
be located within the apparatus. The apparatus is
apparatus preferably included herein but not at least
until the case is sufficiently supported or the filled
glass films. Membranes are inserted within each chamber
station and the preferred mode of a preponderance of the
the tube to be supported or to the suction device so
that the air does escape from the chamber at a rate.
The filling station without interfering with the filling
process.

The filling station is preferably provided with a means to permit
a fluid arrangement and the apparatus to move as the
example to permit the automatic transfer of elements to
meet the requirements of the apparatus. Such an
nealing which is included therein with the station of
a form of a pump for system. The apparatus and elements
may be caused to transfer to the intermediate
system utilizing the filling station and permit to return
to their starting point or as may escape into the tank
causing to be filled. Obviously the opposite arrangement
adopted will reflect the nature of this silencing
production line, but the apparatus into the tank and
primary elements are preferably those discussed
above.

The invention further includes a silencer production line
equipped with the apparatus of this invention, or modified
to carry out the process of this invention.
Description of Preferred Embodiment.

In order that the invention be better understood and aspects of it will now be described by way of example with reference to the accompanying drawings in which:

Figure 1 is a diagrammatic cross-sectional side view of a "straight-through" silencer.

Figure 2 is a diagrammatic cross-sectional side view of a double-ended silencer having a central fibre-free region, and Figures 3 and 4 show progressive stages in the operation of part of a preferred apparatus for carrying out the process of the invention to make the silencer of Figure 1, shown diagrammatically cross-sectional side view.

Figure 5 shows the filling station of Figure 4 in rather more detail and Figure 6 shows the filling station of Figure 5 from direction a.

Figure 7 shows a modified version of Figure 6 in rather more detail and Figure 8 shows it at an oblique direction a in Figure 7.

Figure 9 illustrates the internal construction of a particularly preferred form of filling jet for use at any of the filling stations shown.

In figure 1 a cylindrical casing 1 has a centrally-disposed perforated tube 2 extending between and through end closures 3 and 4. The volume surrounding the tube is filled with glass fibers. The tube is otherwise unsupported until the closures are seamed to it and to the casing, except by the filling jet.
In Figure 2 the same casing 1 and spacers 2 and 3 are used, but the tube 2 is in two sections 4 and 5 respectively, the ends of which overlap inside the casing to butt against internal partitions 6 and 7 respectively. The partitions and casing together define a filling volume 10 between two separate volume filled with figure 1, 12.

Referring now to Figures 3 and 4, one open end 16 of a silencer casing of the Figure 1 (straight-through) kind is shown with a length of perforated tube 17 lying inside it. Advancing axially towards it is a filling station, parts only of which are shown, in the interests of simplicity. The casing is supported by conveyer (not shown) incorporating a magnet operable to hold the tube 17 relative to the casing until engaged by the filling station. The latter comprises a tubular spacer element 13 having resilient marginal portion 14 configured to locate and seal against the open end of the casing 16. A central support 15 advances with the spacer element until its shaped end 15 engages the tube 17 and lifts it away from the casing to a desired position relative to the centre line of the casing, as shown in Figure 4. The centre 19 of the support 15 is hollow, to enable air to escape from the casing through the perforations in the tube 17. It will be appreciated that exactly the same arrangement applies at the opposite end of the casing, so that filling can take place from both ends at once.

The length of the tube 17 will normally be greater than that of the casing and if so the length of the support 15 can be suitably changed to accommodate the projection of tube 17 beyond the end of the casing. Also not shown in this simplified diagram are the presser means which are preferably used to pack any overflow of glass fibres into
the casing from inside the spacer element 13. After such a packing operation, the tube 17 will not normally require further support; the silencer casing, the tube and in-filled material can be forwarded for installation of the end closures in the usual way.

Figures 5 and 6 show a modified apparatus in which a backing plate 31 carries two bulking jets 32, each of which is supplied with continuous filament glass fibre roving 34 and high pressure air (typically at 450 KN/M²) through pipe 33. The jets are preferably of the kind discussed below. The plate 31 has a resilient face 35 which abuts against the open end of a silencer casing 36. The casing contains a perforated exhaust gas duct 37, the free end of which is located by and against a locating stud 38 on the plate 31. This also serves to prevent glass fibres being blown down into the duct, the opposite end A of which is open to allow the free escape of air from the casing during filling. The rovings 34 are metered from roving packages (not shown) by means of godet wheels (not shown) operated in the manner discussed earlier.

The operation of the station just described results in rapid filling of the casing with bulked glass fibres 40, at least until the bulk density approaches about 50 kg/m³, or roughly half of a typical target bulk density in the range 80 to 100 kg/m³. The quality of the bulking process then falls off, to the point where free passage of material into the casing becomes severely impaired and eventually stops. This gives unstable running conditions for the apparatus/process and results in variable bulk density, together with some overflow of material from the casing on transfer to the next production step, which is the installation of an end cap for the casing.
Figures 7 and 8 show the apparatus of Figures 5 and 6 further modified in accordance with a preferred feature of invention. Thus a spacer element 50 having a resilient, silencer casing - contacting margin 51 is interposed between the casing 36 and the backplate 31. A corresponding extension 58 of the original stud 38 is provided to locate and close the perforated duct 37. A press plate 52 is included together with rods 53 operable to displace the plate as indicated by dashed lines towards and into the mouth of the casing (54). The press plate is configured to slide around the stud 38 and incorporates cut-outs to clear the jet nozzles.

Operation is exactly as before, except that for a given mass of glass fibre there is now the added volume of the spacer element available to be filled. By making this volume approximately 50% of the volume of the silencer casing, the problems of the previous apparatus/process discussed are eliminated. There will however be some bulked material overflow into the spacer element itself.

Operation of the press plate to transfer/compact this overflow material well into the silencer casing completes the filling process and the casing can be forwarded for installation of its end cap.

To further illustrate particularly preferred features of the invention, Figure 9 shows a diagrammatic cross-sectional side view (on an enlarged scale) of a bulking jet in accordance with the invention.

The jet comprises a body 62 provided with airstream entry passage 65, a needle 61 in which there is a thread guide 64 opening into a roving entry passage 67, together with an outlet section 63 provided with an outlet passageway 9
terminating abruptly in a flat surface 70. The needle 61 terminates in an annular space 66 defined inside the body 62. The open end of the needle in that space and the opposed entrance to the outlet passageway 69 together define an annular space 68 extending between the space 66 and the inside of the passageway 69. Unlike a conventional bulking jet it is not necessary that the needle should be slidably mounted so that the effective area of the space 68 can be changed by relative axial movement of the needle, whilst retaining a constant, acute angle of contact between air and roving. As previously explained, the outlet passageway 69 is the critical factor.

In use, compressed air is applied to the passage 65. Continuous filament glass fibre roving was fed through the needle at about 600 m/minute using a range of outlet passageway diameters. The quality of the bulking achieved and the time it took to break the roving (on halting the supply) were observed.
The results were as follows:

Table 1

<table>
<thead>
<tr>
<th>Outlet diameter (mm)</th>
<th>Tex</th>
<th>Pressure (KN/MM²)</th>
<th>Air flow</th>
<th>Cutting time (min)</th>
<th>Cutting quality</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>4.5</td>
<td>2400</td>
<td>550</td>
<td>1.08</td>
<td>excellent</td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>2400</td>
<td>515</td>
<td>0.99</td>
<td>very good</td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>2400</td>
<td>470</td>
<td>0.89</td>
<td>good</td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>2400</td>
<td>425</td>
<td>0.60</td>
<td>fairly good</td>
</tr>
<tr>
<td>10</td>
<td>4.5</td>
<td>2400</td>
<td>390</td>
<td>0.78</td>
<td>fair</td>
</tr>
<tr>
<td></td>
<td>4.5</td>
<td>4800</td>
<td>ALL</td>
<td>nil</td>
<td>no cut</td>
</tr>
<tr>
<td></td>
<td>4.0</td>
<td>4800</td>
<td>550</td>
<td>1.44</td>
<td>good</td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>4800</td>
<td>515</td>
<td>1.33</td>
<td>fair</td>
</tr>
<tr>
<td></td>
<td>6.0</td>
<td>4800</td>
<td>480</td>
<td>1.25</td>
<td>poor</td>
</tr>
<tr>
<td></td>
<td>8.0</td>
<td>4800</td>
<td>415</td>
<td>1.33</td>
<td>excellent</td>
</tr>
</tbody>
</table>

It was observed that cutting took place just prior to leaving the outlet, approximately 6 mm inside the passageway, thereby clearly confirming the severity of the forces developed. Tests on the roving entry passageway 67 were also carried out using both ordinary and spliced roving.

Inspection of the foregoing results confirms that optimum (minimum) cutting time and best bulking quality go together, both being primarily a function of air flow.

Table 2

<table>
<thead>
<tr>
<th>Tex</th>
<th>Passage diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2400</td>
<td>2.5 - 3.0</td>
</tr>
<tr>
<td>4800</td>
<td>3.0 - 4.0</td>
</tr>
</tbody>
</table>
At the preferred length to diameter ratio of 15, diameters in the above ranges gave acceptable results.

It is to be noted that the 860 tex roving referred to above was made up of two separate rovings of 430 tex each, thereby indicating that jets according to this invention will successfully handle more than one roving and therefore have significantly greater throughputs than conventional jets.

It will be evident that the use of jets of the kind just described is extremely advantageous for the purposes of this invention, namely the filling of automotive silencer casings with glass fibres.
CLAIMS
The claims defining the invention are as follows:

1. A process for filling an automotive interlock casing with glass fibres characterized by the steps of presenting oppositely directed open ends of the casing substantially simultaneously to glass fibre feeding stations and filling the casing from both ends thereof.

2. The process of claim 1 characterized by the further steps of feeding continuous filament glass fibre roving to each feeding station and converting the roving to relatively bulky form prior to filling the casing with it.

3. The process of claim 1 or claim 2 characterized in that the roving is either cut into staple form prior to bulking, or remains in continuous filament form throughout.

4. The process of claim 2 characterized in that the roving is converted to relatively bulky form by the step of passing it through a bulking box comprising a roving entry passageway, an airstream entry passageway and means for distributing the airstream evenly around the roving as in an essentially annular sheath in the region of contact therebetween, together with a common outlet passageway for the airstream and roving, wherein the flow restriction due to that area of the annular defining said sheath immediately prior to the region of contact is significantly less than that due to that of the common outlet passageway.
5. The process of any preceding claim, characterized by the step of temporarily locating one end of a tubular spacer element on each open end of the casing prior to filling.

5. The process of claim 1 characterized by the step of pushing fibres from the spacer element into the casing prior to removing the spacer elements to enable affixing the closures to the ends of the casing.

7. The process of any preceding claim where the casing contains an otherwise unsupported perforated tube and the process is further characterized by the steps of locating and/or temporarily retuning this tube axially and radially with respect to the casing at least until there is sufficient in-filled material to do so.

8. Apparatus for filling an automotive wheel or casing with glass fibres characterized by the provision of two glass fibre feeding stations and means for presenting oppositely directed open ends of the casing to said stations substantially simultaneously.

9. The apparatus of claim 8 further characterized by the provision of at least one bulking jet at each feeding station and means to bulke a continuous filament glass fibre entering prior to formation in the casing by the jet to bulke continuous filaments.
10. The apparatus of claim 1 characterized in that the
building has comprised entering entry passageway, an
airstream entry passageway and sound the entering
the airstream passageway is of the common canal
essentially another entry in the region of contact
the so-called to extend a common canal
passageway for the airstreams and moving within the
flow restriction due to that ease of the channel
defining wall greater containers prior to he region
of contact is significantly lower than that due to the
common outlet passageway.

11. The apparatus of claim 1 characterized in
that the outlet passageway of the common canal is
parallel-sided and cylindrical with a mean to

diameter ratio of from 3 to 10 and that the moving
entry passageway has a mean to diameter ratio in
the range from 10 to 30.

12. The apparatus of claim 1 characterized by the
provision of a columnar shaped element associated
with each feeding station together with means for
preserving said shaped element to the spout end of
the casing so as to constitute an extension of the
casing intermediate the casing and the feeding
station.

13. The apparatus of claim 1 characterized by
the inclusion of means means operable to push any

overflow of glass into the spout element
into the casing prior to transfer of the latter to
apparatus operable to effect closures in the ends
thereof.
The apparatus of any of claims 8 to 14 characterised by the provision of means for location in an otherwise unsupported tube within and relative to the casing at least until the tube is sufficiently supported by the in-filled glass fibres.

15. The apparatus of claim 16 characterised in that the locating and/or retaining means include a magnet.

16. A process and apparatus for filling an automotive silencer casing with glass fibres substantially as hereinafter described with reference to the accompanying drawings.

DATED this 9 day of November 1984.

JAMES M. LAWRIE & CO.

by: [Signature]

Patent Attorneys for
TBA INDUSTRIAL PRODUCTS LIMITED
DRAWINGS
END