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(54) Runner cover for metallurgical heat retention.

(57) A trough cover (1), comprising a plurality of cover (2) panels, encloses a trough (t) adapted to carry hot molten material (m) to contain gaseous emissions and heat released from the molten material (m) and to prevent foreign matter from entering the trough. Each panel (2) comprises a channel-shaped support member (5) and a refractory member (6), preferably a ceramic fiber material-type refractory, the refractory (6) covering the surface of the support member (5) exposed to the molten material. A fastening means (9) secures the panels (2) together to form the top (3) and side walls (4) of the cover (1) whereby and essentially continuous refractory interior surface (10) is formed by the refractory members (6). The refractory insulates the fastening means (9) and the support members (5) of the panels (2) from the molten material (m). In alternate embodiments, stiffening flanges are provided on the support member and a handle rod is provided to facilitate lifting of the cover when covering or uncovering the trough.

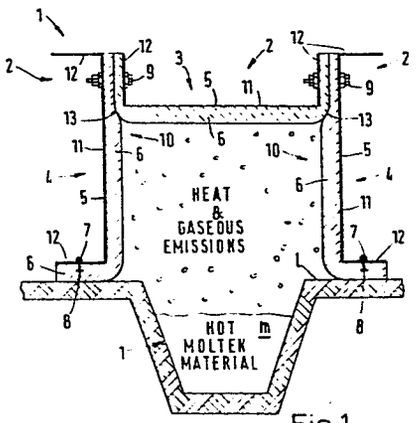

Fig.1

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Runner Cover for Metallurgical Heat Retention

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Field of the Invention

A trough cover comprised of a plurality of refractory lined cover panels is used to enclose troughs carrying hot molten materials in order to protect the material from impurities which may fall into the trough and to contain the heat and gaseous emissions released by the molten material.

Background of the Invention

Various means to enclose the troughs or runners, which are used to carry molten material, in order to control air pollution and/or ensure material purity have been proposed. In United States patent 4,245,820 a pipe curtain, formed by a plurality of independently suspended pipes, is illustrated as a means to control air pollution emissions from various vessels including troughs. However, with this design, numerous components are necessary in order to provide an adequate curtain for a trough such as those normally found in steel mills. In addition, the uncovering of any length of the trough requires the removal of numerous individually suspended pipe sections. In United States patent 4,216,708, an air curtain is used in conjunction with an air supply along one side of a runner while an exhaust assembly is provided along the other side in order to contain the heat and gaseous emissions from the molten metal in the trough. A refractory wall may be provided to protect the exhaust assembly from the hot gases. While emissions are controlled by this apparatus, it does not retain heat well or prevent debris

or other impurities from entering the trough and is of a much more complex structure than the trough cover of the present invention.

In contrast to the above trough covers, the present invention embodies a trough cover formed of a plurality of refractory lined panels, each panel being of a simple and sturdy yet lightweight construction and readily fabricated in various lengths and widths. The panels, which provide standardized starting units, are easily fitted together to form a completed trough cover which, when placed over a trough, prevents the escape of heat and gaseous emissions released by molten material carried therein. The lightweight trough covers can be easily lifted when covering or uncovering the trough.

It is an object of this invention to provide a trough cover for troughs adapted to carry molten material comprising a plurality of cover panels which when joined together form an essentially continuous refractory lining on the interior surface of the cover exposed to the molten material.

It is another object of this invention to provide a lightweight easily removable cover for a trough which also prevents the entry of foreign material or impurities into the trough while simultaneously preventing the escape of heat and emissions from the molten material in the trough.

Other forms and features of this invention will become evident when reading the following specification when taken in conjunction with the drawings provided.

Summary of the Invention

A trough cover includes a plurality of cover panels joined together to form the top and downardly depending side walls thereof, and is used to enclose a trough adapted to carry hot molten material such as iron. Each cover panel comprises a

channel-shaped rigid support member and a refractory member, preferably of fiber material-type refractory, covering the entire interior surface of the cover which is exposed to the molten material. The support member comprises a base having two legs depending from the edges of the base and extending along the length thereof. A fastening means is used for securing the panels together to form the top and side walls of the cover such that an essentially continuous refractory lining is formed about the entire interior surface of the cover that is exposed to the molten material. The refractory member insulates the fastening means as well as the support member from the molten material. This allows lighter weight materials such as sheet metal to be used in the construction of the support member.

Description of the Drawings

Figure 1 is a cross-sectional view of a trough cover according to the invention;

Figure 2 is a cross-sectional view of an alternate embodiment of the invention illustrating a trough cover having a trapezoidal cross-section allowing it to span a larger trough without the use of additional panels;

Figure 3 is a cross-sectional view of an alternate embodiment of a trough cover illustrating a multi-panel top, stiffening flanges and a handle rod; and

Figure 4 is a perspective view of two trough covers as illustrated in Figure 3 covering a trough.

Detailed Description

As shown in figure 1, which illustrates a generally U-shaped trough cover 1, the trough cover comprises a plurality

of cover panels 2 which form the top 3 and downwardly depending side walls 4 of the cover 1, to enclose a trough t, adapted to carry hot molten material m, such as iron. Each panel 2 comprises a channel-shaped rigid support member 5 and a refractory member 6 covering the entire surface thereof which is exposed to the molten material. The refractory member 6 is fixed to the support member in such a manner that any attachment means therefor will be insulated from the hot molten material. For example, pop rivets 7 and washers 8 may be used with the rivets 7 passing through the support member 5, the attachment means protected by the refractory member 6. Other attachment means are usable provided that the same is protected from or will withstand the temperatures to which the refractory material is to be exposed when the cover is in use over a trough containin molten material. A fastening means 9 is used to join the panels 2 together to form the top 3 and side walls 4 of the cover 1 such that an essentially continuous refractory lining is formed about the entire interior surface 10, of the cover 1 which is exposed to the molten material. The refractory member 6 insulated the support member 5 and fastening means 9 from the heat and gaseous emission released from the molten material in the trough t. In the embodiment illustrated, each support member 5 has a base 11 and two legs 12 depending from the edges thereof and along the length of the base 11. The legs 12 provide rigidity for the support member 5. By arranging the panels 1, as illustrated, the entire interior surface 10 of the cover is formed by the refractory member 6, and a seal 13 is formed between the respective refractory members of a side wall 4 and the top 3 of the cover, with the fastening means maintaining the seal such that the interior surface of the trough comprises a substantially continuous refractory surface.

As shown in figure 1, the panels 2 are joined together so that a substantially 90° angle exists between the side walls 4 and the top 3 with fastening means 9 connecting the base 11 of the side walls 4 with the legs 12 of the top 3. Here the legs 12 form a sustantially right angle with the base 11. Figure 2 illustrates the legs 12 as having an angle, A, greater than 90°, with the base 11 and forming a cover 1 having a generally trapezoidal cross section. The range of this base/leg angle is between about 90 to 150°. Preferably, where the base/leg angle is greater than about 90°, the legs 12 of each panel 2 used in a cover are bent to the same base/leg angle in order to simplify construction and assembly of the panels. Increasing the angle A allows a trough cover to span a larger trough without the need for additional cover panels in the top of the cover.

Various widths and lengths are possible for an individual panel used to form a cover, depending upon the size of the trough to be covered. Typically, each of the panels is about 4 to 6 feet in length and has a width of about 6 to 18 inches. In order to provide greater widths, additional cover panels are used in the top of the cover when the cover is being assembled. Typical spans for the covers are in the range of 18 to 48 inches, requiring approximately one to four panels being used in the top of the cover. Usually each side wall of the cover is a single panel, however, their height may be increased in the same manner previously described for increasing the width of the top.

In figure 3, a trough cover 51 having a tri-panel top 53 is shown. The construction of each panel 52 is the same as previously described, each having a support member 55 with a base 61 and legs 62, a refractory member 56 and an attaching means for this member such as a pop rivet 57 and washer 58, and a fastening

means 59, except that each leg 62 is provided with an inwardly directed flange 64 depending from the free end 65 of the leg 62. The flanges 64 are substantially parallel with the base 61 of each panel 52 and provide additional rigidity for the cover 51. The interior surface 60 of the cover is thus completely formed of refractory members 56, with seals 63 formed between contiguous such members. In addition, a handle such as a rod 56 is shown fastened to the flanges 64 of the panels 52 in the top 53 of the cover 51. This allows the cover 51 to be more easily grasped and lifted when covering or uncovering the trough. The handle rod 66 is attached by conventional fastening means such as tack welding or by a bolt and nut. Preferably two handle rods are used per cover with the ends of each rod extending outwardly beyond the side walls (see figure 4).

As shown in figure 4, more than one cover is used to cover the length of a trough. Typically the individual covers 51, are simply butted against one another across their widths, the refractory member 56 of the individual covers 51 forming an essentially continuous refractory lining, formed by the interior surfaces of the panels, along the entire combined length of the covers and about the entire surface of the covers exposed to the molten material in the trough t. In use the covers are simply placed over the trough and rest on the lips 1, thereof. A sand seal, s, can be provided along the edge of the cover panel in contact with the lip, 1, of the trough, t, in order to fill in surface irregularities in the trough lip; thus, allowing a better seal between the trough and cover.

The trough cover may be used with a variety of molten materials having high temperatures. For example, when a trough is carrying molten iron, the temperature of the iron is approxi-

mately 2800° F. with the temperature at the exposed surface of the refractory members of the cover panels in the top and side walls of the cover reaching approximately 2200° F. The refractory chosen for use in the refractory member should be capable of withstanding these elevated temperatures without deterioration. Preferably, a fiber material-type refractory such as Fiberfrax is used (Fiberfrax is a registered trademark of The Carborundum Company for a ceramic fiber-type refractory material). However other material such as thermal blankets or foundry cloth can also be used in combination with or in lieu of Fiberfrax depending upon the expected temperatures to be encountered during use of the trough cover.

As illustrated in figure 4, an alternate embodiment uses end legs and flanges on the panels for additional rigidity. The end legs 67 enclose the end of the support member 55 and is intermediate the legs 62 and depend from the base 61 thereof similar to the legs previously described. As shown, an inwardly directed end flange 68 can also be provided at the free end of each end leg 67. This end flange 68 is substantially parallel to the base 61 of the support member 55 and also provides additional rigidity thereto. The end flanges 68 can be tack welded or secured by other fastening means to the flanges 64 of the legs 62 of the cover.

What is claimed is:

1. A cover for a trough adapted to carry hot molten material, the cover having a top and downwardly depending side walls, and having interior and exterior surfaces, the cover comprising:

a plurality of panels, each said panel having a channel-shaped rigid support member, and a refractory member covering a surface of said rigid support member; and

fastening means securing said plurality of panels together to form said top and side walls, with the refractory members forming the interior surface of said cover, a portion of refractory member insulating said fastening means from said interior surface, whereby the interior surface of the cover, that is exposed to hot molten material in the trough, comprises a substantially continuous refractory surface.

2. The cover of claim 1 wherein the channel-shaped rigid support member comprises a base and two legs depending from the edges thereof, each leg having a free end and an inwardly directed flange extending therefrom, the flanges being substantially parallel to the base and providing additional rigidity for the support member.

3. The cover of claim 2 including at least one handle rod fastened to the flanges of at least one panel forming the top of the cover so that the cover may be easily lifted when covering or uncovering the trough.

4. The cover of claim 1 wherein the refractory member will withstand elevated temperatures of at least as high as 2200° F. without thermal deterioration.

5. The cover of claim 4 wherein the refractory member is a ceramic fiber material-type refractory.

6. The cover of claim 1 wherein the support member is comprised of sheet metal.

7. The cover of claim 6 wherein each panel has a length of about 4 to 6 feet and a width of about 6 to 18 inches.

8. The cover of claim 2 wherein each leg and the base form an angle in the range of between about 90 to 150°.

9. The cover of claim 2 wherein the support member has an end leg depending from each end of the base and intermediate said two legs, each end leg having a free end and an inwardly directed end flange extending therefrom, the end flange being substantially parallel to the base.

10. A cover for a trough adapted to carry hot molten material, the cover having a top and downwardly depending side walls, and having exterior and interior surfaces, the cover comprising:

a plurality of panels, each said panel having a channel-shaped rigid support member of sheet metal, comprising a base and two legs depending from the edges thereof, and a refractory member covering a surface of said rigid support member, which refractory member will withstand elevated temperatures of at least as high as 2200° F. without

fastening means securing said plurality of panels together to form said top and side walls, with the refractory member forming the interior surface of said cover, a portion of refractory member insulating said fastening means from said interior surface, whereby the interior sure surface of the cover, that is exposed to hot molten material in the trough, comprises a substantially continuous refractory surface.

11. The cover of claim 10 wherein the two legs of said support member have an inwardly directed flange extending therefrom, the flanges being substantially parallel to the base and providing additional rigidity for the support member, and at least one handle rod fastened to the flanges of at least one panel forming the top of the cover so that the cover may be easily lifted when covering or uncovering the trough.

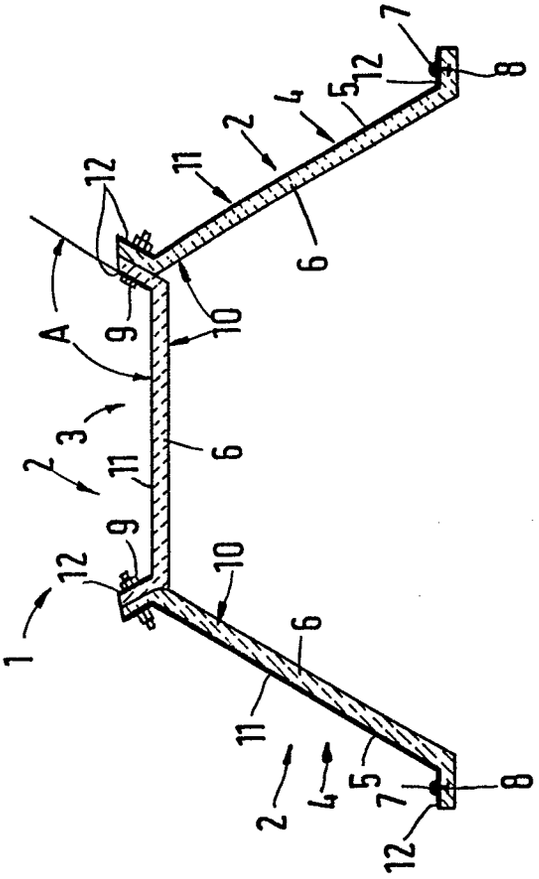
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Fig. 2

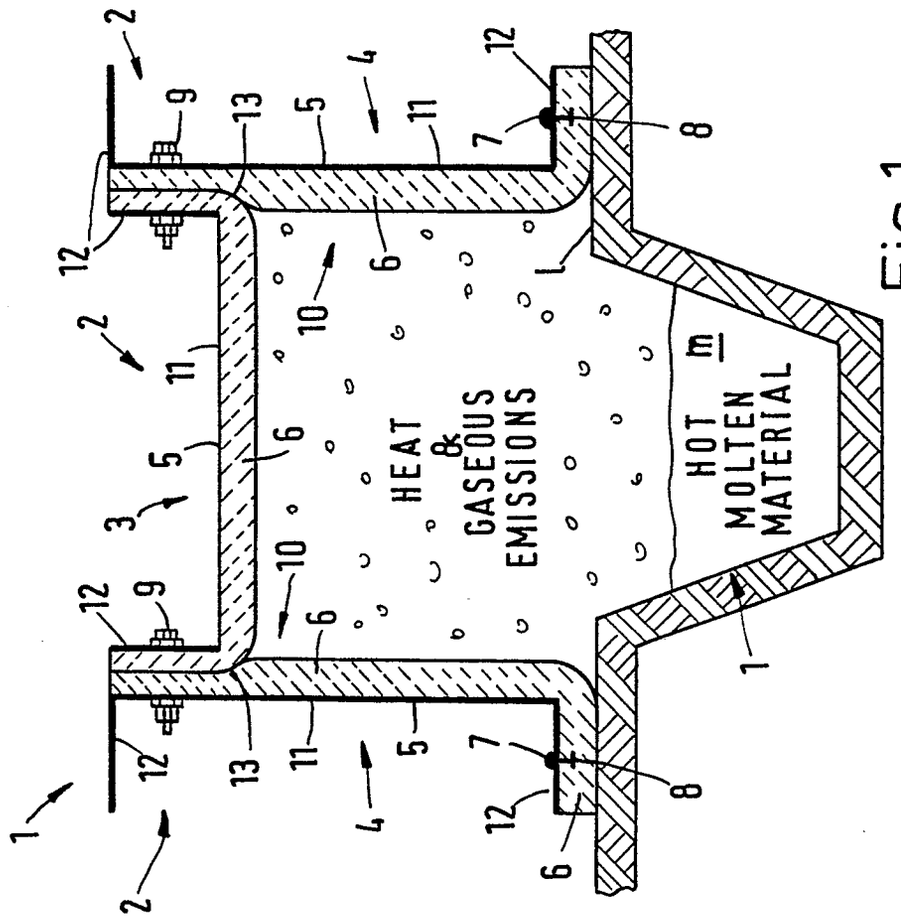
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Fig. 1

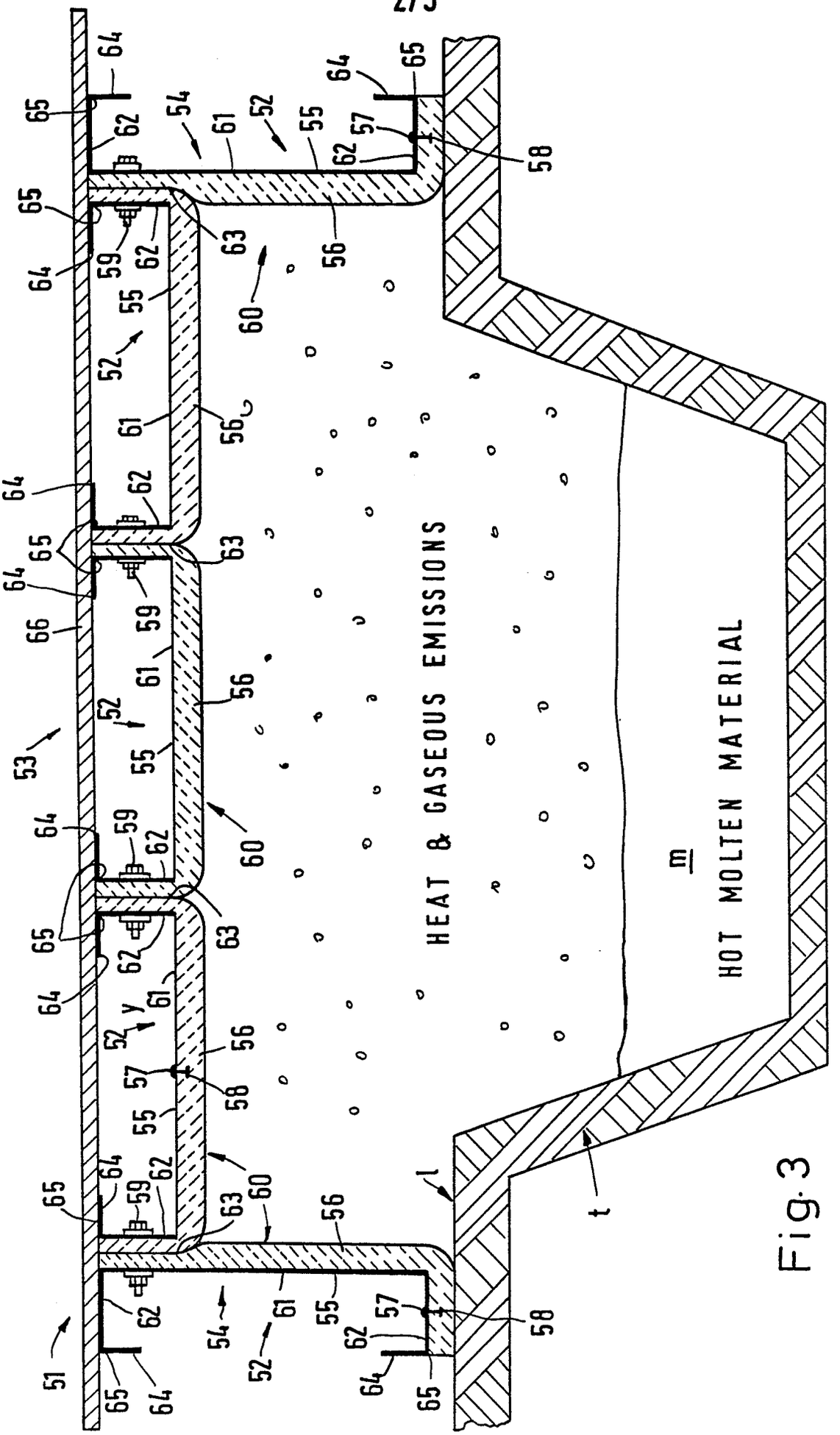

Fig.3

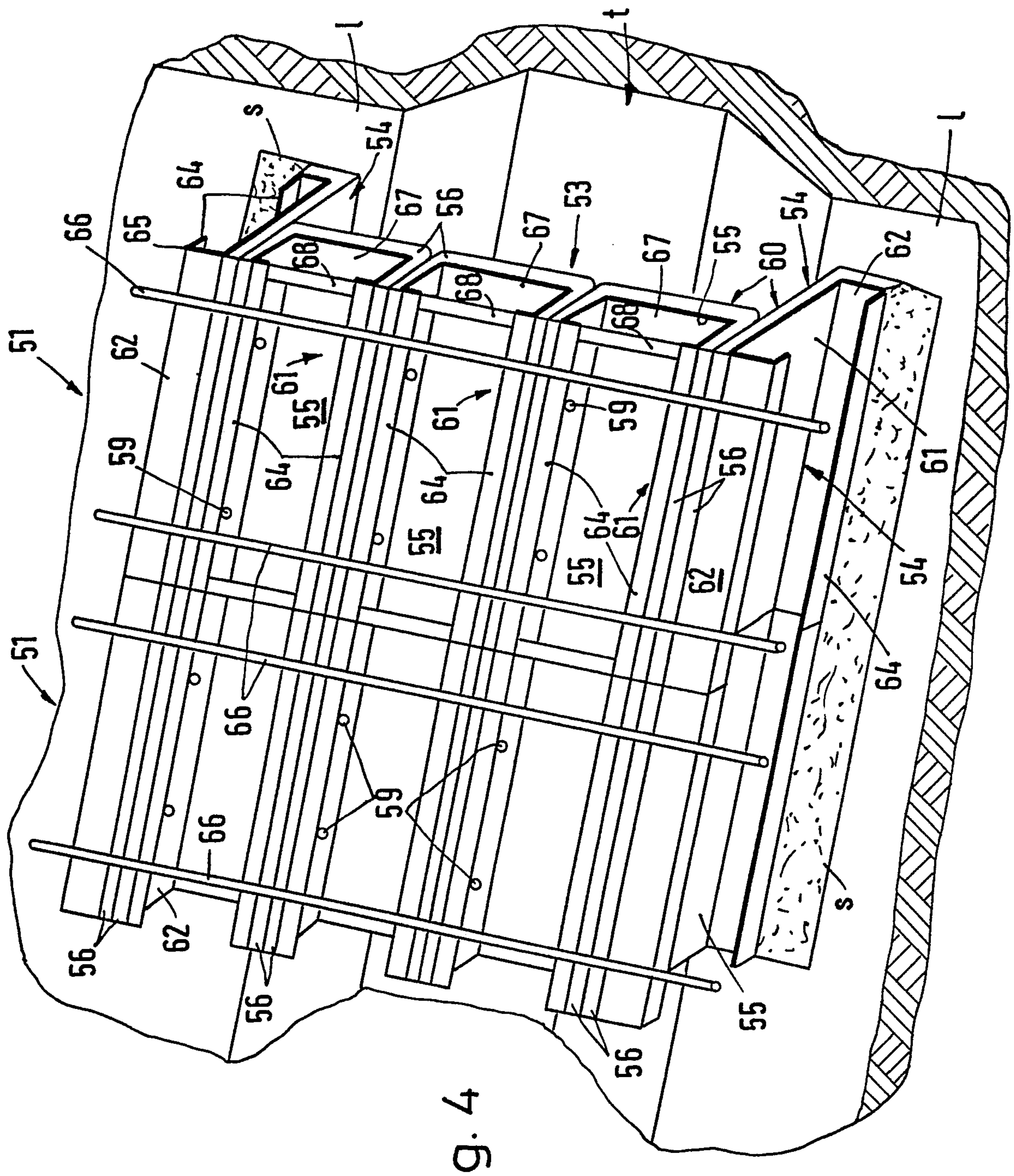

Fig. 4

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European Patent Office

Application number

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EUROPEAN SEARCH REPORT

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
A	DE-A-2 943 106 (AAR DAL OG SUNDAL VERK)		F 27 D 3/14 B 22 D 45/00
A,D	US-A-4 245 820 (STEPHEN MURYN)		

TECHNICAL FIELDS SEARCHED (Int. Cl. ³)

F 27 D
C 21 B
B 22 D
F 27 B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	23-09-1982	ELSEN D.B.A.

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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