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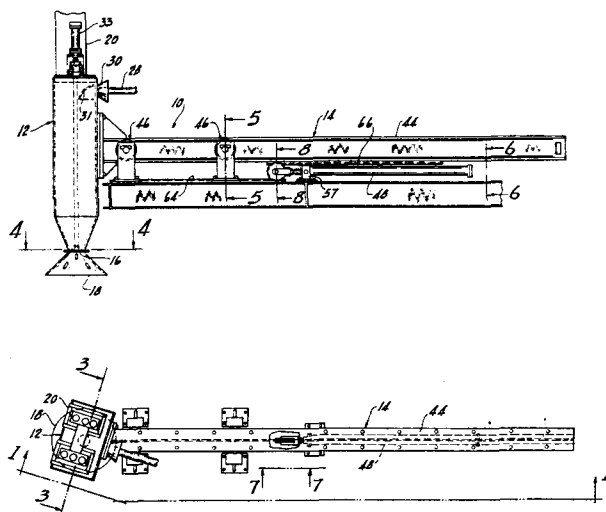
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Dispenser for synthetic slag forming material.

A dispenser (10) of material for forming a synthetic slag in a metallurgical treatment ladle includes an elongate vertically oriented housing (12) having a tapered discharge section (23) above an open lower end. A conical closure member (18) is supported for reciprocal movement into and out of a closed position relative to the discharge opening (16). The closure member (18) has a surface portion surrounding the margin of the opening (16) and having a plurality of holes (42) formed therein in a predetermined array so that the slag forming material will be evenly distributed over the surface of the molten metal. The housing (12) is mounted at the end of a boom (14) for horizontal movement to position the discharge opening (16) above the ladle of metal being treated. A filter (20) is located at the upper end of the housing (12) for removing particles from the air used to transport the material to the dispenser (10).



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DISPENSER FOR SYNTHETIC SLAG FORMING MATERIALS

This invention relates to a material dispenser and more particularly to a device for dispensing slag forming materials into a metallurgical vessel.

5 It is a common practice to treat molten metal, such as steel, in a ladle. For example, the metal may be desulfurized or its composition modified by the addition of alloying or other additives. In desulfurization of ferrous metals, materials such as calcium carbide, calcium
10 oxide, lime, fluorspar, magnesium oxide, burnt dolomite or alumina are blown into the metal contained in a treatment ladle. Before, during or after the completion of these procedures, it is desirable to cover the surface of the molten metal with a synthetic slag material so as to
15 enhance metallurgical reactions and provide thermal insulation to reduce heat loss from the molten material.

The slag forming materials may be delivered to the plant site in any suitable manner such as by trucks which are
20 commonly unloaded into storage facilities, such as silos, in any suitable manner. From the storage area, it is common to move the material to the point of use by means of pneumatic transport systems. Such systems commonly include a conveying pod which is located below the storage
25 silo so that it can be filled by gravity flow of material. The conveying pod may be mounted on load cells so that the weight of material which will be delivered to the ladle is determined by the weight of molten metal and the amount of slag, if any, carried over from the melting furnace. This

information is entered into a microprocessor which controls the filling of the conveying pod. When the proper weight of material has been added to the conveying pod, it is mechanically sealed from the storage silo and then pressurized using compressed air. Upon reaching the proper pod pressure appropriate valves are opened in the conveying pipes extending between the pod and the material dispenser. The material is then carried by the compressed air to the dispenser.

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It is an object of the invention to provide a new and improved dispenser for slag forming materials.

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Another object of the invention is to provide a dispenser for slag forming material which evenly distributes the material on the surface of the molten metal.

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A further object of the invention is to provide a dispenser for slag forming material which can readily be positioned above the molten material.

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In general terms, the invention provides a dispenser for discharging artificial slag forming material in a substantially uniform manner onto the surface of molten metal in a container disposed therebelow. The dispenser comprises a housing, an opening formed in the lower end of the housing for discharging material therefrom, and a closure member having a central portion movable into and out of a closed position relative to the opening, and a skirt portion surrounding the central portion and extending outwardly and downwardly relative thereto. A plurality of holes are formed in the skirt portion and disposed in a spaced apart array so that the artificial slag making material moves outwardly from the central portion and onto the skirt portion under the influence of gravity when the closure member is displaced from said opening with portions of the material falling through the

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holes and the remainder passing over the outer edge of the skirt portion for evenly distributing the material over the surface of the molten metal disposed in a ladle therebelow.

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According to another aspect of the invention, the housing is mounted at the end of an elongate horizontally extending member which is supported on a roller. Cylinder means is disposed below the member and oriented generally parallel thereto. Piston rod means extend from the cylinder and gear means is mounted on the piston rod means. A first rack means is mounted below the elongate member and a second rack means is mounted on the elongate member and parallel to the first rack means, the gear means being engageable with the first and second rack means for moving the dispenser toward and away from the container.

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Embodiments of the invention will now be described by way of example, reference being made to the accompanying drawings in which:-

Figure 1 is a side elevational view of a material dispenser according to the invention;

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Figure 2 is a top view of the dispenser shown in Figure 1;

Figure 3 is a view taken along lines 3-3 of Figure 2;

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Figure 4 is a view taken along lines 4-4 of Figure 1;

Figure 5 is a view taken along lines 5-5 of Figure 1;

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Figure 6 is a view taken along lines 6-6 of Figure 2;

Figure 7 is a view taken along lines 7-7 of Figure 2;

Figure 8 is a view taken along lines 8-8 of Figure 1;
and

Figure 9 is a side elevational view of an alternate
embodiment of the invention.

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In general terms, the invention is shown in Figures 1 and
2 to comprise a dispenser 10 which includes an elongate,
vertically oriented housing 12 mounted at the end of a
horizontally extending boom 14 which is mounted for
longitudinal movement so that the housing 12 can be
positioned above the centre of a ladle of hot metal (not
shown). The housing 12 has a discharge opening 16 at its
lower end and a cooperating general conical closure member
18 which is movable vertically into and out of a closed
position relative to the opening 16. A pair of filters 20
are disposed at the upper end of the housing 12 for
removing dust particles from the transport air prior to
its discharge into the atmosphere.

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The housing 12 may have any convenient shape but is shown
in Figures 1 and 3 to have a generally rectangular upper
section 22 and a lower, tapered discharge section 23. The
upper section is closed by a cover plate 25 and the lower
end of the discharge section terminates in the opening 16.
There is, in addition, a second opening 26 formed adjacent
the upper end of housing 12 and below the cover plate 25
for receiving the end of conduit 28 which is coupled at
its other end to the pressurized storage pod (not shown).
A conical inlet guide 30 is disposed about opening 26 and
a curved baffle 31 is affixed to the inner surface of
housing 12 and extends downwardly and inwardly in front of
the opening 26 to divert material downwardly into housing
12.

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A hydraulic cylinder 33 is suitably supported on a bracket
mounted atop the cover plate 25. Cylinder 33 is

located along the axis of housing 12 and a rod 36 extends downwardly from its lower end. It will be appreciated that the rod 36 is coupled to a piston (not shown) disposed within the cylinder 33 and is movable axially upon the application of hydraulic pressure. An elongate rod member 38 is coupled at its upper end to the piston rod 36 and extends downwardly through an opening 39 in cover plate 25 and along the axis of housing 12 where its lower end is suitably fixed to the conical closure member 18. The cylinder 33 may be double-acting in which event the closure member 18 will be moved by hydraulic pressure between its open and closed positions. Alternatively the cylinder 33 may be single acting in which event hydraulic pressure acting on the upper end of the cylinder will move the enclosure closure member 18 to its open position and a spring (not shown) will urge the piston rod 35 upwardly so that the member 18 will be moved to its closed position in the absence of hydraulic pressure. A flexible seal 40 may be provided between the cover plate 25 and the piston rod 36 for closing the opening 39 through which the rod 38 extends.

A pair of conventional filters 20 are mounted on cover plate 25 and each communicates with the interior of housing 12 through suitable openings. It is sufficient for purposes of understanding the operation of the invention to state that the air filters are operative to filter any particulate material entrained in the conveying air before it is discharged to the atmosphere.

The closure member 18 is shown in Figures 3 and 4 to have a plurality of openings 42 distributed around its surface. The size and pattern of the openings 42 may vary according to the size and flowability of the material being dispensed and the desired distribution on the surface of the molten metal. In any event, the openings 42 are located in that portion of the closure member 18 which is

outside of the opening 16 while the centre portion of the skirt is imperforate so that no material will discharge from the dispenser 10 when the member 18 is in its closed position.

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The boom 14 includes an elongate, horizontally oriented carrier beam 44 which is mounted on roller assemblies 46 for longitudinal movement under the influence of a hydraulic cylinder 48. The dispenser housing 22 is mounted at one end of the carrier beam 44 for horizontal movement therewith.

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After the housing 12 has been filled with the proper weight of material, the hydraulic cylinder 48 will be pressurized. This moves the gear 62 toward the left as viewed in Figure 1 whereby the teeth on its outer periphery which are in engagement with stationary rack 64 and the rack 66 on beam 44 thereby moving the beam 44 toward the left on rollers 53. It will be appreciated that because the teeth in gear 62 engage the racks 64 and 66, the beams 44 will be displaced through a distance equal to twice the distance travelled by the gear 62. The beam 44 will be displaced in this manner until the housing 12 is positioned above the ladle of molten metal being treated.

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When the housing 12 is in position, the cylinder 33 will be actuated to lower the conical closure member 18. This will permit the material to flow downwardly along the inclined surface of the member 18. Some of the material discharging along the surface of the member 18 will pass through the openings 42 and the remainder will pass over the outer periphery. This will ensure even distribution of the material on the surface of the molten metal.

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As seen more particularly in Figure 5, the carrier beam 44 is generally I-shaped in transverse cross-section. Each

roller assembly 46 includes a pair of stands 50 mounted adjacent the opposite sides of the carrier beam 48 and each of which has a shaft 51 affixed adjacent its upper end. The shafts 51 are coaxial and each carries a roller
5 53 which is rotatably mounted thereon and which engages rails 55 which are fixed respectively to the upper and lower flanges of the carrier beam 44.

The cylinder 48 has a pair of trunnion pins 56 extending
10 from its opposite sides for being received in bearings 57 mounted in suitable openings formed of a pair of opposed supports 58 fixedly mounted below the carrier beam 44. This pivotally mounts the cylinder about one end with its axis extending generally parallel to and below the carrier
15 beam 44. Extending from the cylinder 48 is a piston rod 60 which has a forked member 61 mounted at its outer end for rotatably receiving a gear 62 on a shaft 63. The gear 62 engages a first fixed rack 64 mounted below and parallel to the cylinder 48 and a second rack 66 fixed to
20 the underside of the carrier beam 44. This provides a motion multiplier so that the beam will move a distance twice that of the cylinder rod 60.

In operation the slag forming material is delivered to the
25 housing 12 through the pipe 38. The material may be in any form which will flow readily from the opening 16 but is preferably in granular form having a size of about one quarter inch or slightly larger. Those skilled in the art will appreciate that the slag forming material may
30 comprise, for example, burnt dolomite, calcium oxide, magnesium oxide, silica, fluorspar or alumina. Also, a suitable hot topping material may be employed. As the housing 12 is being filled, the carrier air will exhaust through the filters 20 for the removal of entrained
35 particulates.

Figure 9 shows an alternate embodiment of the invention where the dispenser 10 is suitably mounted at one end of

an elongate arm 80 for horizontal movement. The arm 80 is mounted at the upper end of a support column 82, the lower end of which is received in a bearing 84. Means, not shown but which are well known in the art, are provided for rotating the column 82 within the bearing 84 and about a vertical axis. This moves the dispenser 10 in a horizontal arcuate path so that it may be selectively positioned above the ladle 85 or moved to an inactive position away from the ladle.

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CLAIMS:

1. A dispenser for discharging artificial slag forming material in a substantially even manner over the surface of molten metal in a container, said dispenser comprising: an elongated housing having an inlet for receiving the artificial slag forming material, the housing being tapered adjacent its lower end which terminates in a discharge opening, a closure member for the opening and means for moving the enclosure member into and out of the opening, characterized in that the closure member is tapered and has an apex presented towards the discharge opening, the closure member having a central portion receivable in the opening for closing the same and an outer portion extending outwardly from said central portion and beyond the margins of the opening, the outer portion terminating in an outer periphery, and a plurality of holes formed in the outer portion and in a spaced apart relation to each other.
2. A dispenser according to claim 1, characterised in that the closure member is conical.
3. A dispenser according to claim 1 or 2, characterised in that the holes in the closure member are distributed in a uniform array around the outer portion.
4. A dispenser according to claim 1, 2 or 3, characterised by a plurality of openings formed in the upper end of the housing, and air filter means communicating with said openings.
5. A dispenser according to any one of claims 1 to 4, characterised in that the housing is mounted at the end of an elongate, horizontally extending member, roller means supporting the member, cylinder means disposed below the member and generally parallel thereto, piston rod means

5 extending from the cylinder, gear means mounted on the
piston rod means, first rack means mounted below the
elongate member and second rack means mounted on the
elongate member and parallel to the first rack means, said
gear means being engageable with the first and second rack
means for moving the dispenser toward and away from the
container.

10 6. A dispenser according to any one of claims 1 to 4,
characterised in that said housing is mounted at the end
of an elongate, horizontally extending member and means
for pivoting said member about a vertical axis displaced
from said dispenser so that said dispenser is moved in an
arcuate horizontal path.

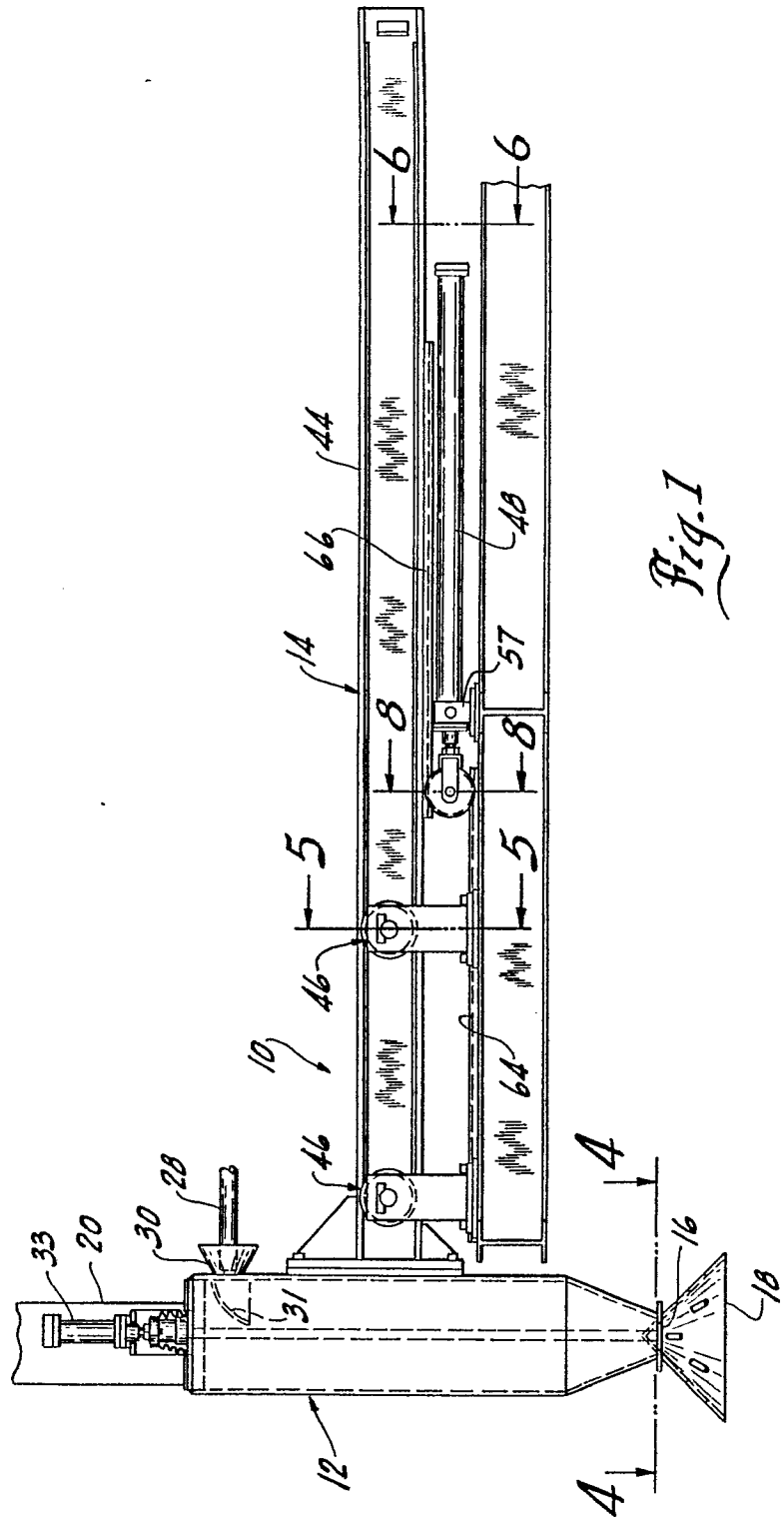
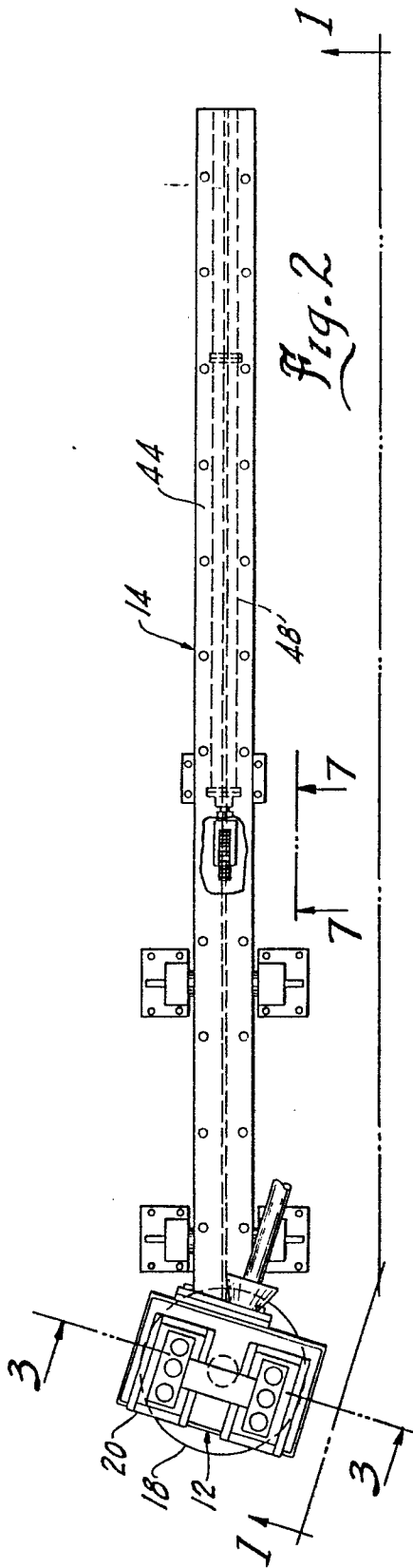
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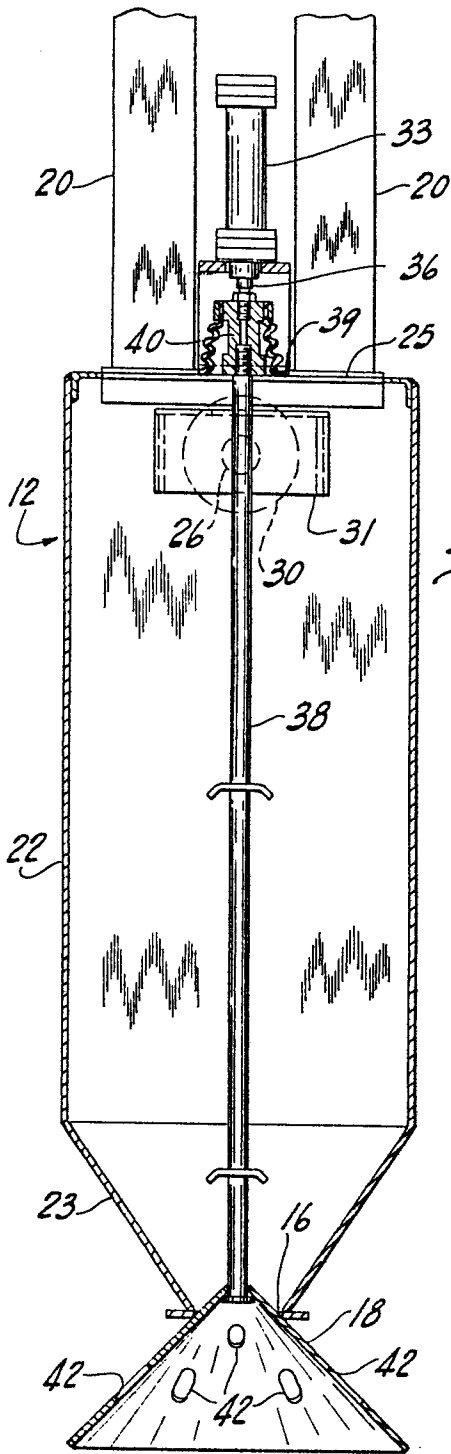


Fig. 3

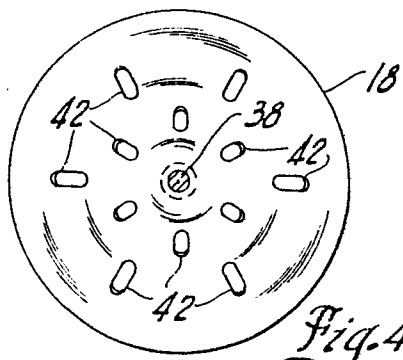


Fig. 4

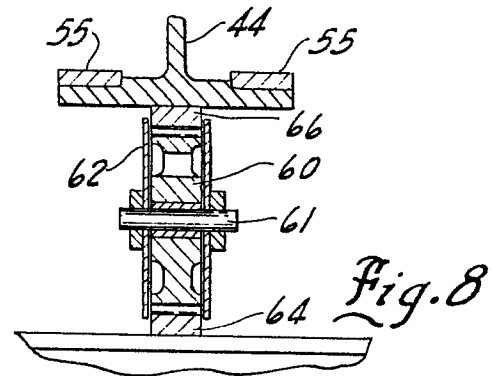


Fig. 8

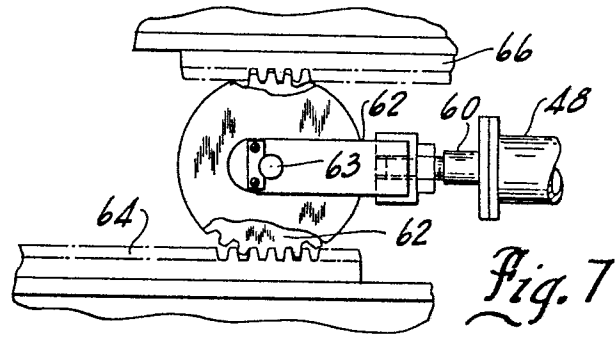


Fig. 7

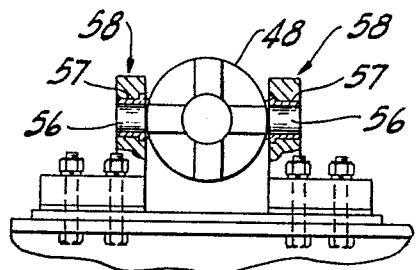


Fig. 6

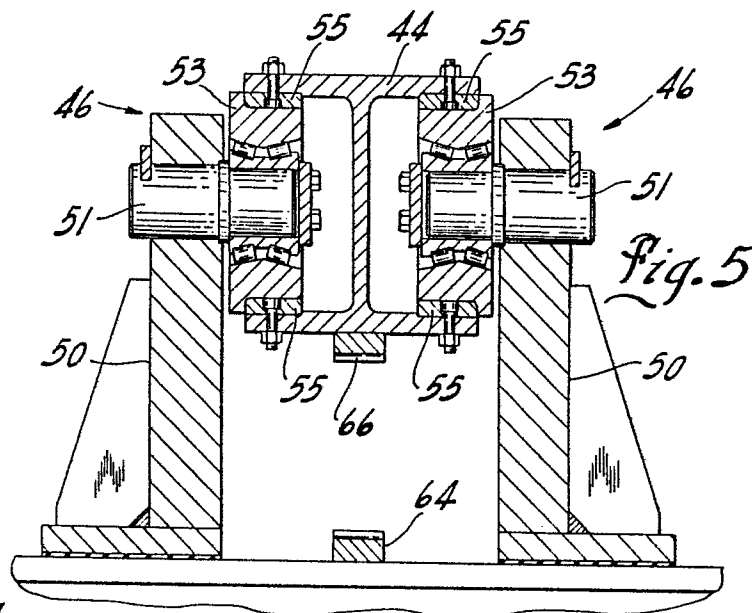


Fig. 5

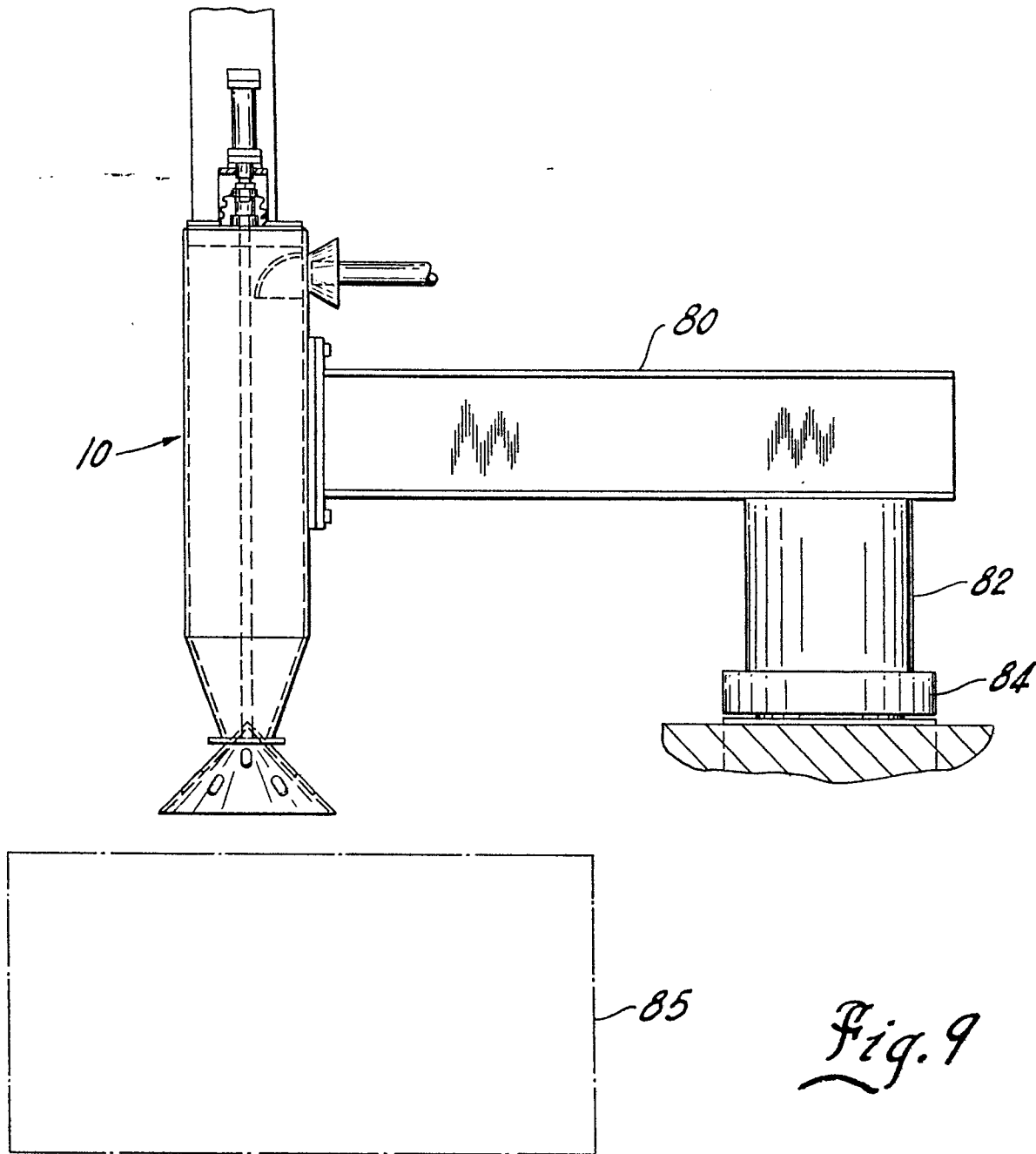


Fig. 9

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European Patent
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EUROPEAN SEARCH REPORT

Application number

EP 85 30 5177

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. 4)
A	EP-A-0 059 411 (SCANDINAVIAN LANCERS) * Figures; claims; abstract *	1	C 21 C 7/00 C 22 B 9/10 B 22 D 11/10 B 05 B 7/14
A	US-A-3 224 748 (G. BÜDENHAGEN)		
A	US-A-2 494 067 (SNOWDEN et al.)		
A	FR-A-2 458 322 (CLESID)		
A	FR-A-2 491 364 (MORIVAL)		
			TECHNICAL FIELDS SEARCHED (Int. Cl. 4)
			C 21 C C 22 B B 22 D B 05 B
The present search report has been drawn up for all claims			
Place of search THE HAGUE	Date of completion of the search 31-10-1985	Examiner OBERWALLENEY R.P.L.I	
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			