(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 699 620 A1

(12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
06.03.1996 Bulletin 1996/10

(51) Int Cl.[6]: **B66D 1/74**

(21) Application number: **95305940.9**

(22) Date of filing: **24.08.1995**

(84) Designated Contracting States:
BE CH DE ES FR GB IT LI NL SE

(30) Priority: **01.09.1994 GB 9417533**

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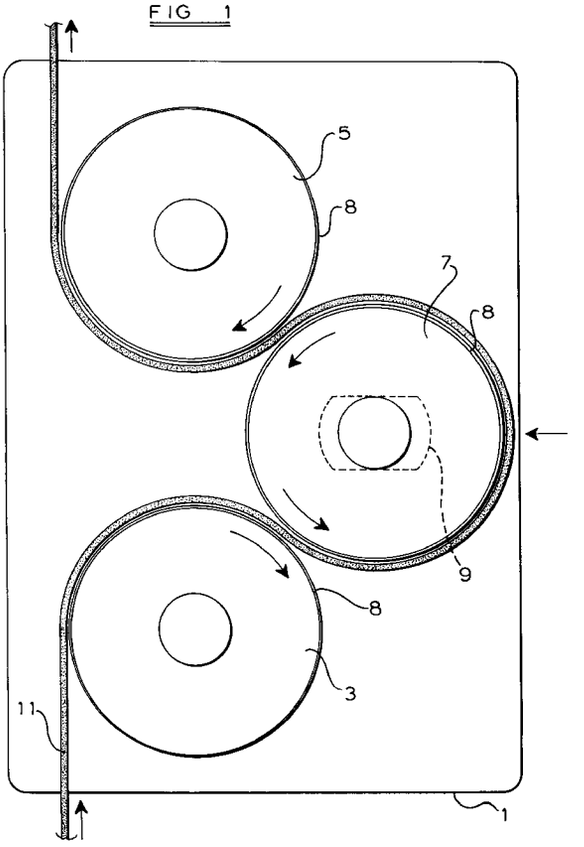
(54) Winch mechanism

(57) A winch mechanism includes first, second and third rolls (3, 5, 7) for receiving therearound a webbing, cable, rope or the like (11). The first and second rolls (3 and 5) are rotatable about the axes thereof and the third roll (7) is rotatable about the axis thereof and is also moveable towards and away from a line joining the axes of the first and second rolls at a point along the line intermediate the first and second rolls. The webbing, cable, rope or the like extends around that part of the periphery of the first roll (3) on that side thereof remote from the third roll (7), then passes between the first roll and the third roll, then extends around that part of the periphery of the third roll (7) remote from the line joining the axes of the first and second rolls (3 and 5), then passes between the second roll (5) and the third roll (7), and finally extends around that part of the periphery of the second roll on that side thereof remote from the third roll. The first, second and third rolls (3, 5, 7) and the webbing, cable, rope or the like (11) are dimensioned such that the distance between the first and second rolls (3 and 5) is less than the diameter of the third roll (7) with the webbing, cable, rope or the like (11) extending therearound.

FIG 1



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Description

The present invention is concerned with a winch mechanism for gripping and moving a webbing material or a cable, rope or like material.

Traditional drum winches for wire ropes incorporate a drum onto which the wire rope is wound, the axial length of the drum being considerably greater than the diameter of the wire rope. As the wire rope is wound onto the drum, the wire accumulates on the drum as a number of side-by-side turns which eventually build up into a number of layers. However, as the number of layers builds up the mechanical advantage of the winch decreases.

It is also known to employ webbing material in winches in place of the conventional cable or rope. Webbing material has the advantages that it is extremely strong and lightweight, but with webbing it is essential that each turn is wound on top of the preceding turn. Thus the effective diameter of the winch increases with each turn and the mechanical advantage rapidly decreases. Nevertheless, given the advantages of webbing material there is a demand for a winch which can be used with webbing material but which does not suffer the problem of a rapidly decreasing mechanical advantage.

It is therefore an object of the present invention to provide a winch mechanism for gripping and moving inter alia a webbing material.

According to the present invention there is provided a winch mechanism comprising first, second and third rolls for receiving therearound a webbing, cable, rope or the like, the first and second rolls being rotatable about the axes thereof and the third roll being rotatable about the axis thereof and being moveable towards and away from a line joining the axes of the first and second rolls at a point along the line intermediate the first and second rolls,
the arrangement of the webbing, cable, rope or the like being such that it:

(a) extends around that part of the periphery of the first roll on that side thereof remote from the third roll;

(b) passes between the first roll and the third roll;

(c) extends around that part of the periphery of the third roll remote from the line joining the axes of the first and second rolls;

(d) passes between the second roll and the third roll; and

(e) extends around that part of the periphery of the second roll on that side thereof remote from the third roll,

the first, second and third rolls and the webbing, cable, rope or the like being dimensioned such that the distance between the first and second rolls is less than the diameter of the third roll with the webbing, cable, rope or the like extending therearound.

The first, second and third rolls may be mounted between a pair of side plates. The third roll may be slidably mounted in the side plates, for example by means of slots or recesses formed therein.

The third roll may be moveable in a direction substantially perpendicular to the line joining the axes of the first and second rolls.

The third roll may be moveable along a line which intersects the line joining the axes of the first and second rolls at a point substantially midway between the axes of the first and second rolls.

The webbing, cable, rope or the like may comprise a webbing material.

One or more of the first, second and third rolls may be provided with a relatively high friction material around the periphery thereof.

The first, second and third rolls may be dimensioned such that the distance between the first and second rolls is less than the diameter of the third roll.

One of the first and second rolls may be provided with drive means. The drive means may be powered, for example mechanically, hydraulically or electrically, or may be operable manually. The driven roll and the third roll may be interconnected by means of gears such that rotation of the driven roll causes corresponding counter-rotation of the third roll.

The webbing, cable, rope or the like wound in by the winch mechanism may be stored in storage means, such as on a rotatable drum.

The winch mechanism may include a braking mechanism to allow controlled unwinding of the webbing, cable, rope or the like.

For a better understanding of the present invention and to show more clearly how it may be carried into effect reference will now be made, by way of example, to the accompanying drawings in which:

Figure 1 illustrates one embodiment of the a drumless winch mechanism according to the present invention;

Figure 2 is a side elevational view of one embodiment of a drumless winch mechanism in the direction of the arrow shown in Figure 1; and

Figure 3 is a side elevational view of another embodiment of a drumless winch mechanism in the direction of the arrow shown in Figure 1.

The drumless winch mechanism shown in the figures comprises a pair of side plates 1, only one of which is shown in Figure 1 for clarity, having mounted rotatably therebetween three rolls 3, 5 and 7. The rolls 3, 5 and 7 may be made of any suitable material. Where the pulling capacity of the winch mechanism is low, the rolls may be

made of plastics material, but for higher pulling capacities the rolls may be made of aluminium or steel. To increase the frictional properties of the peripheries of the rolls, the rolls may be provided therearound with a material 8 having relatively high frictional properties, such as a polyurethane material. The side plates 1 in the illustrated embodiment are generally rectangular, although any convenient shape may be employed, and the side plates may be made of any suitable material, such as aluminium pressure die castings.

The rolls 3, 5 and 7 are mounted in a rotatable manner in the side plates 1. The axes of the rolls 3 and 5 are stationary, while roll 7 is mounted in such a way that it is moveable towards and away from a line joining the axes of rolls 3 and 5. In the embodiment illustrated in Figure 2 the roll 7 is mounted in slots 9 formed in the side plates 1, while in the embodiment of Figure 3 the roll 7 is mounted in recesses 10 formed in the side plates, the slots 9 or recesses 10 extending in a direction substantially perpendicular to the line joining the axes of rolls 3 and 5 and being positioned substantially mid-way between the axes of rolls 3 and 5. However, it should be noted that the same effect can be achieved by a loose-fit of the roll 7 in the side plates 1. The slots 9 are positioned to one side of the line joining the axes of rolls 3 and 5 such that the axis of roll 7 is positioned to one side of the line joining the axes of rolls 3 and 5. However, the precise disposition of the slots 9 relative to the line joining the axes of rolls 3 and 5 may be varied to some extent without affecting the operation of the winch mechanism in any significant detrimental manner. Moreover, the slots 9 may be replaced by any suitable configuration, such as elongate recesses, which permit movement of the roll 7 towards and away from the line joining the axes of rolls 3 and 5.

Extending around the rolls 3, 5 and 7 is a webbing material 11. The webbing material may be, for example, of polyester or other natural or man-made material. The webbing material enters the winch mechanism and contacts part of the periphery of roll 3 on that side of the line joining the axes of rolls 3 and 5 remote from roll 7. The webbing material 11 then passes between the rolls 3 and 7 and around that part of the periphery of the roll 7 remote from the line joining the axes of rolls 3 and 5. Thereafter, the webbing material passes between the rolls 7 and 5 and around that part of the periphery of roll 5 on that side of the line joining the axes of the rolls 3 and 5 before passing out of the winch mechanism.

The rolls 3, 5 and 7 are dimensioned, in conjunction with the thickness of the webbing material 11, such that the minimum distance between the peripheries of the rolls 3 and 5 is less than the diameter of the roll 7 with the webbing material extending therearound. Thus the roll 7 with the webbing material extending therearound is unable to pass between the rolls 3 and 5. It may be desirable, for safety reasons, for the minimum distance between the peripheries of the rolls 3 and 5 to be less than the diameter of the roll 7. Although the rolls 3, 5 and 7 are shown as all having substantially the same diameter, this is not essential and the rolls 3, 5 and 7 may each have any suitable diameter. Ideally the width of the rolls 3, 5 and 7 is substantially the same as the width of the webbing material 11.

It should be noted, however, that the webbing material may be replaced by a conventional cable or rope material.

The lower end of the webbing material 11 as illustrated in Figure 1 is connected to a load (not shown), but it should be noted that the winch mechanism need not be oriented as shown in the figure. The upper roll 5 as illustrated in Figure 1 is connected as shown in Figures 2 and 3 to drive means 13 or 15. The drive means 15 shown in Figure 3 comprises mechanically, electrically or other powered drive means, while the drive means 13 shown in Figure 2 comprises a handle or the like for manual operation.

To assist operation of the winch mechanism, the driven roll 5 and the moveable roll 7 may be interconnected as shown diagrammatically in Figure 2 by gears 17, 19 secured to both the driven roll 5 and the moveable roll 7. The gears may be, for example, deep tooth spur gears which remain engaged irrespective of the position of the moveable roll 7 relative to the slots 9. The gears 17, 19 may be made of any suitable material depending on the pulling capacity of the winch mechanism. When the capacity of the winch mechanism is low, plastics gears may be used, but as the pulling capacity rises the gears may be made of aluminium or steel.

The upper end of the webbing material 11 may pass to a suitable form of storage such as the drum arrangement 21 shown diagrammatically in Figure 3 for the webbing material. It will be appreciated, however, that because the drum is not operating as a winch mechanism the issue of mechanical advantage does not arise.

The winch mechanism also incorporates a braking mechanism 23, also shown diagrammatically in Figure 3, which may be of any convenient known form. The braking mechanism allows the winch mechanism to be self-sustaining. The use of an automatic self-sustaining brake mechanism ensures safe operation when lifting and accurate control when lowering.

In operation of the winch mechanism, a length of webbing material 11 is passed around the rolls 3, 7 and 5 as previously described. That end of the webbing material 11 extending from the roll 3 is connected to a load (not shown) while the other end of the webbing material may pass, for example, to a storage drum as shown in Figure 3. The effect of the load, in combination with the braking mechanism 23 is to allow controlled unwinding of the winch mechanism and to urge the roll 7 in a direction towards the line joining the axes of the rolls 3 and 5. Therefore the greater the load the greater the force with which the roll 7 is urged against the webbing, cable, rope or the like positioned between the roll 7 and the rolls 3 and 5 and, consequently, the greater the frictional forces between the rolls 3, 5 and 7 and the webbing material 11.

Clockwise rotation of the upper roll 5 illustrated in

the figure, in combination with the gears 17, 19 where provided, exerts a pulling or lifting force on the webbing material and consequently on the load. Because the webbing material passes through the winch mechanism, and is not accumulated on a drum or the like which is used to transfer the pulling or lifting force to the load, the winch mechanism according to the present invention permits a constant force to be exerted on the load rather than the force which varies as winding progresses. Further, the height of lift or the distance through which a load can be moved is limited only by the length of webbing material that is available and not by the dimensions of the winch mechanism.

The winch mechanism according to the present invention provides a lightweight lifting or pulling device for example for tightening overhead electric cables, telegraph wires, fencing or the like. The mechanism is sufficiently light for such applications to be operated with one hand by a person working on a pylon or up a pole. Alternatively, the winch mechanism may be used in DIY applications, such as changing a car engine or moving a boat or caravan.

The load capacity of the winch mechanism may be, for example, in the range from 0.25 tonne to 5 tonnes or more.

Claims

1. A winch mechanism characterised by first, second and third rolls (3, 5, 7) for receiving therearound a webbing, cable, rope or the like (11), the first and second rolls (3 and 5) being rotatable about the axes thereof and the third roll (7) being rotatable about the axis thereof and being moveable towards and away from a line joining the axes of the first and second rolls at a point along the line intermediate the first and second rolls,
the arrangement of the webbing, cable, rope or the like (11) being such that it:

   (a) extends around that part of the periphery of the first roll (3) on that side thereof remote from the third roll (7);

   (b) passes between the first roll (3) and the third roll (7);

   (c) extends around that part of the periphery of the third roll (7) remote from the line joining the axes of the first and second rolls (3 and 5);

   (d) passes between the second roll (5) and the third roll (7); and

   (e) extends around that part of the periphery of the second roll (5) on that side thereof remote from the third roll (7),

   the first, second and third rolls (3, 5, 7) and the webbing, cable, rope or the like (11) being dimensioned such that the distance between the first and second rolls (3 and 5) is less than the diameter of the third roll (7) with the webbing, cable, rope or the like (11) extending therearound.

2. A winch mechanism as claimed in claim 1, characterised in that the first, second and third rolls (3, 5, 7) are mounted between a pair of side plates (1).

3. A winch mechanism as claimed in claim 2, characterised in that the third roll (7) is slidably mounted in the side plates (1), for example by means of slots (9) or recesses (10) formed therein.

4. A winch mechanism as claimed in any preceding claim, characterised in that the third roll (7) is moveable in a direction substantially perpendicular to the line joining the axes of the first and second rolls (3 and 5), for example along a line which intersects the line joining the axes of the first and second rolls at a point substantially midway between the axes of the first and second rolls.

5. A winch mechanism as claimed in any preceding claim, characterised in that the webbing, cable, rope or the like (11) comprises a webbing material.

6. A winch mechanism as claimed in any preceding claim, characterised in that one or more of the first, second and third rolls (3, 5, 7) is provided with a relatively high friction material (8) around the periphery thereof.

7. A winch mechanism as claimed in any preceding claim, characterised in that the first, second and third rolls (3, 5, 7) are dimensioned such that the distance between the first and second rolls (3 and 5) is less than the diameter of the third roll (7).

8. A winch mechanism as claimed in any preceding claim, characterised in that one of the first and second rolls (3 and 5) is provided with drive means (13, 15).

9. A winch mechanism as claimed in claim 8, characterised in that the drive means (15) is powered, for example mechanically, hydraulically or electrically.

10. A winch mechanism as claimed in claim 8, characterised in that the drive means (13) is operable manually.

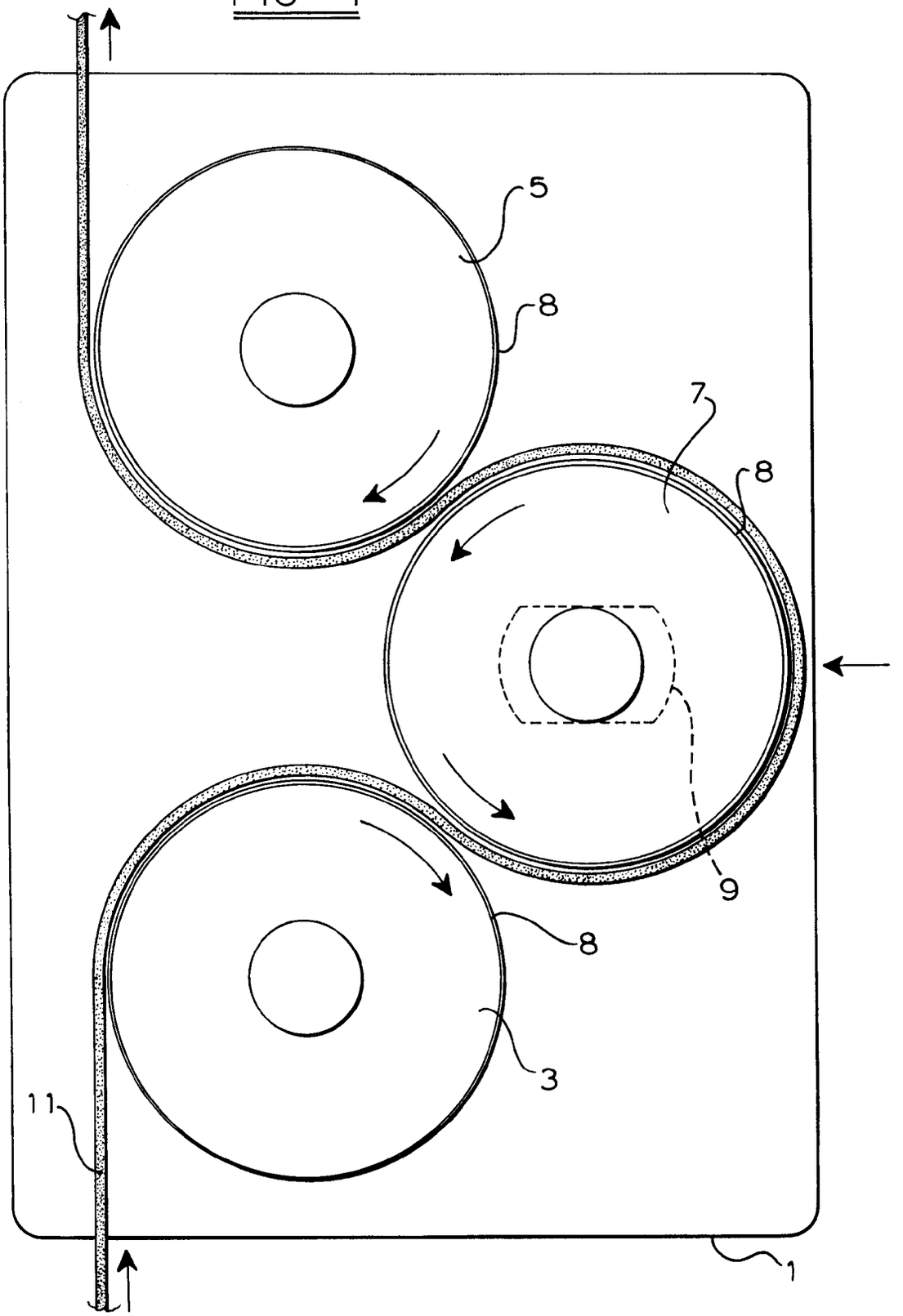
11. A winch mechanism as claimed in any one of claims 8 to 10, characterised in that the driven roll (3 or 5) and the third roll (7) are interconnected by means of gears (17, 19) such that rotation of the driven roll (3

or 5) causes corresponding counter-rotation of the third roll (7).

12. A winch mechanism as claimed in any preceding claim, characterised in that the webbing, cable, rope or the like (11) wound in by the winch mechanism is stored in storage means (21) such as a rotatable drum.

13. A winch mechanism as claimed in any preceding claim and including a braking mechanism (23) to allow controlled unwinding of the webbing, cable, rope or the like (11).

FIG 1



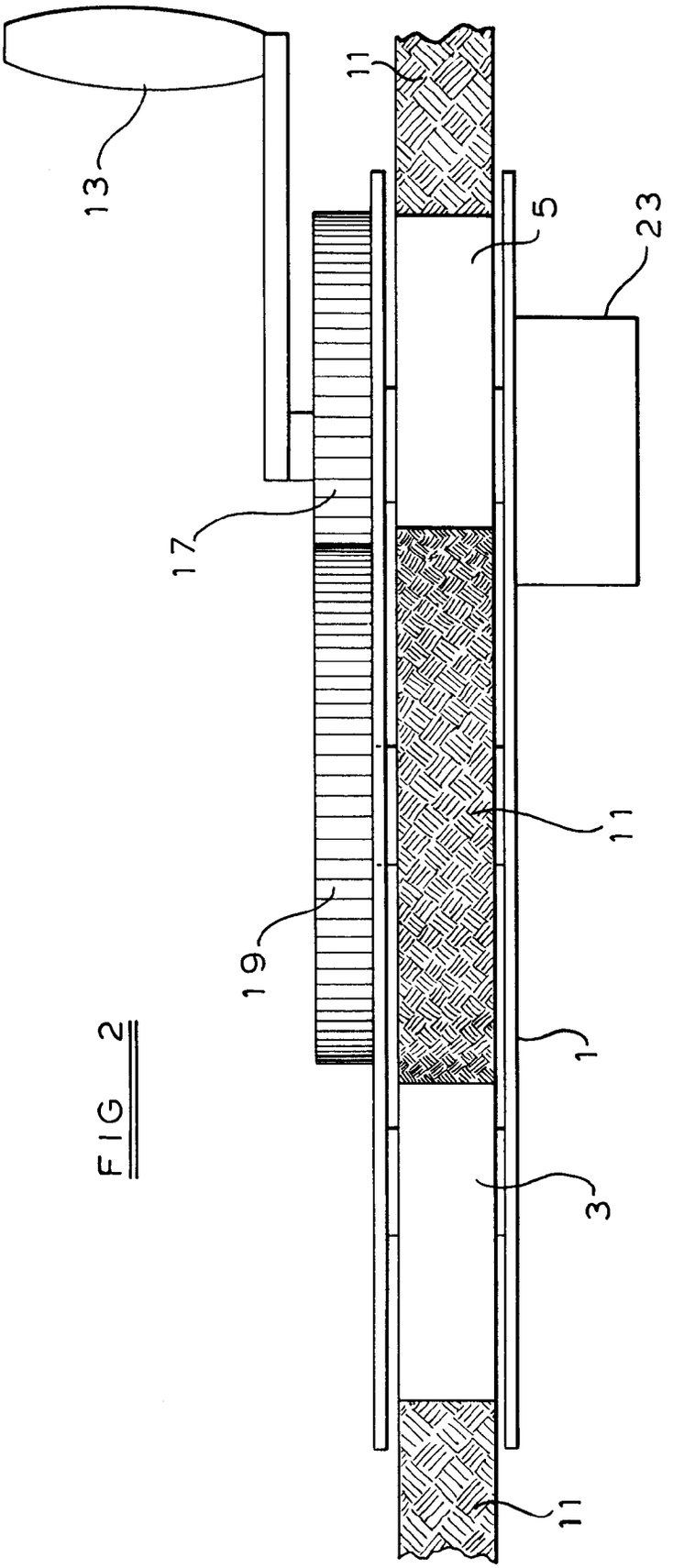


FIG 2

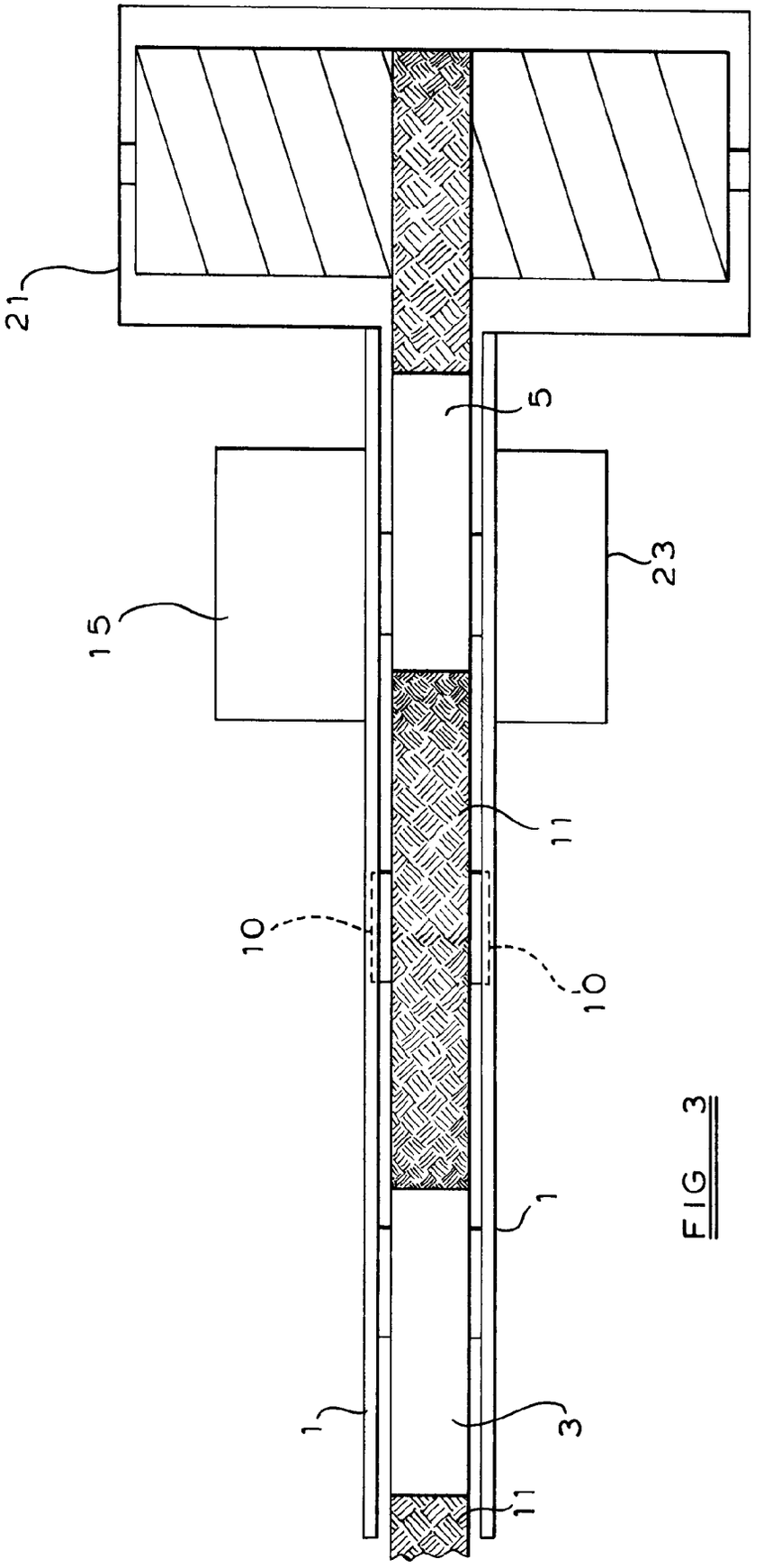


FIG 3

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 30 5940

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.6)
X Y	FR-A-2 217 259 (KÄUFER) * the whole document *	1-4, 7-10,13 5,6,12	B66D1/74
Y	EP-A-0 343 063 (TRACTEL) * column 5, line 4 - column 8, line 24 *	5,6,12	
X	DE-C-872 987 (THE YALE & TOWNE MANUFACTURING COMPANY) * the whole document *	1-4,7,8, 11,13	
A	GB-A-2 171 973 (FITZGERALD-SMITH)		
A	EP-A-0 110 250 (HÄNEL)		
A	FR-A-2 434 111 (TRACTEL)		
A	FR-A-2 307 761 (DRESSLER)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)
B66D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	31 October 1995	Van den Berghe, E

CATEGORY OF CITED DOCUMENTS

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