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(54) Device to collect and dump the smoke and dust which are generated during a scarfing operation of slabs.

(57) The invention refers to a device to collect and dump the smoke and dust which are generated during a scarfing operation of slabs and other metallurgical, unfinished products; such device providing a support bench for the slabs to be scarfed, and a scarfing head, sliding on rails along said bench; suction means for the smoke and dust generated by the scarfing operation are also provided.

According to the invention, the device provides a retractable tunnel (20), in the shape of a bellow, secured, on one of its ends, to one end of said bench, where the suction duct of an exhaust fan for the smoke and dust is located; on its other end, the tunnel (20) is integral to a scarfing head (62) in its movement; the retractable tunnel (20) is supported in an intermediate position by trestles movable on wheels (40).

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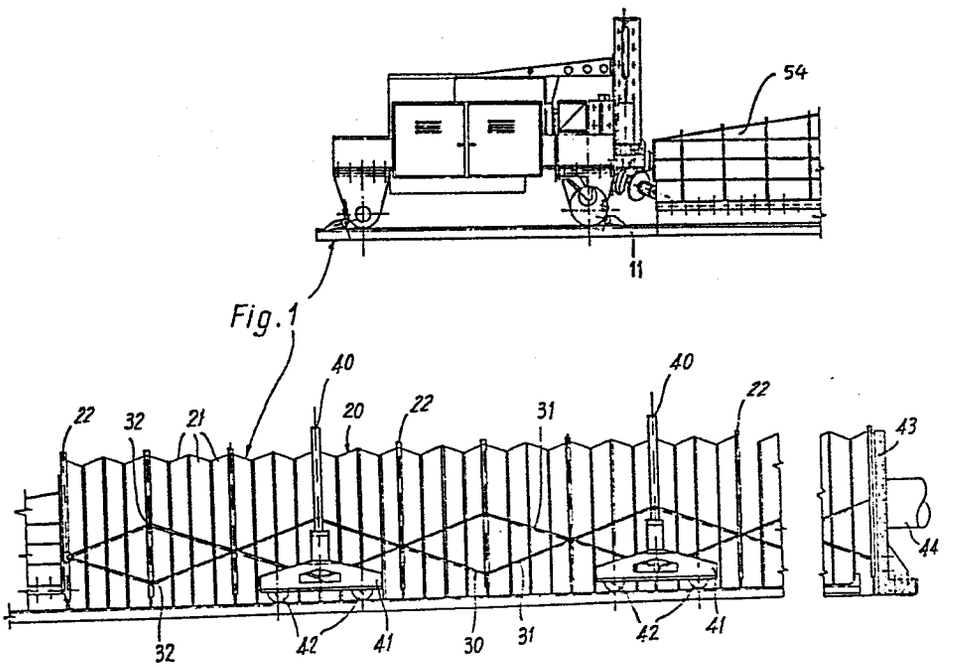

Fig.1

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Device to collect and dump the smoke and dust which are generated during a scarfing operation of slabs

The present invention refers to a device to collect and dump the smoke and dust generated during a scarfing operation of slabs.

It is well known that slabs, and other metallurgical semi-finished products in general, must be scarfed before any successive operations, that is to say, the defective surface material must be removed.

This is done by means of a 100 mm diameter torch, which, through the spark-starting of a voltaic arc, forms a bath of molten steel on the surface, which it pushes along the entire slab surface, by the pressure of the oxygen and the longitudinal traverse of the apparatus. The transverse and longitudinal inclinations of the nozzle render such an operation easy.

It should be noted that such scarfing operation is carried out by sliding the scarfing head described above, along two rails located on the sides of a bench, or of a supporting surface on which the slabs to be scarfed are arranged. It is known that, in order to remove the dust and smoke generated by the scarfing operation from the working area, the operating head is equipped with a hood, integral to said operating head while the latter moves. Said hood is placed over the slab surface to be scarfed, and is connected to a sliding seal, acting as a hood, which directs the smoke and dust into a manifold directly connected to the exhaust fan.

The above described known device has the drawback that it sucks in and removes from the working area only a part of the dust and smoke generated during the scarfing operation. The residual dust and smoke, thus, remain in the working area, negatively affecting the working conditions; further damages to machinery in the working area are to be ascribed to the effects of the smoke and dust which have not been sucked in by the hood.

Hence, the purpose of the present invention is to eliminate such drawbacks, by using a retractable tunnel of a particular shape, which can move together with the operating head and makes it possible to collect all the dust and smoke generated during the scarfing operation.

Moreover, as such dust and smoke often cause the plant to be stopped because of the impossibility for the staff to work there, therefore causing a loss in production, the present invention is a thorough solution to said problems.

It should also be remembered that scarfing is very noisy (because of the oxygen blast) and the retractable tunnel has also the function of lowering noise level.

The retractable tunnel, according to the invention is secured at one end to a wall placed near the end of the bench and on which the suction duct begins for the smoke sucked in by a suitable exhaust fan. At its other end, the retractable tunnel is secured to the scarfing head by means of a firm metal structure, and follows its movement, contracting while said head operates and expanding when it goes back to its start position for a new opera-

tion cycle.

The retractable tunnel according to the invention has the shape of a bellow, suitably supported.

The essential characteristics of the invention are summed up and described in the claims; its advantages and objects will also be discussed in the following specification, with respect to embodiments chosen by way of example only and with particular reference to the enclosed drawings, in which:

Figure 1 shows a side perspective view of the retractable tunnel according to the invention, in the expanded position;

Figure 2 shows a top view of the retractable tunnel according to the invention, in the closed position;

Figure 3 shows a longitudinal vertical section view of one of the two side raceways in which the bottom parts of the tunnel sides project, so as to form a hydraulic seal against the flow of smoke. Said figure dealing in particular with the means necessary to remove the dust and deposits which continuously settle in said raceways;

Figure 4 shows a view of the scarfing head according to plane IV-IV figure 2;

Figure 5 and 6 show a cross section of two possible positions of the above mentioned raceways.

With particular reference to figure 1, 2 and 3: 10 indicates a long shaped base on which the slabs to be scarfed are to be placed; said base 10 has, on its sides, two rails 11, on which the supporting means of the scarfing head and of the bellow shaped retractable tunnel slide, all of which having reference number 20.

Along the internal side of the two tracks 11, there are two raceways 12 full of water, in which the lower parts of the retractable tunnel 20 project, so as to form a hydraulic seal.

The retractable tunnel 20 is formed by a number of folds 21, made of fire and abrasion proof material. It results in a bellow shape which enables the retractable tunnel to change from the expanded position, shown in figure 1, to the contracted position shown in figure 2

In order for it to stiffen up transversally, the bellow shaped retractable tunnel is provided with frames 22, substantially shaped like an upside down U, located at pre-set spaces, for example, constant ones.

Said frames are connected to joints 32 of the articulated arms 32 of a pair of pantographs 30, placed at both sides of the tunnel. Joints 32 of arms 31 suitably slide along frames 22 of the bellow shaped retractable tunnel.

Furthermore, the bellow shaped retractable tunnel 20 is suspended from a pair of portals 40, provided with feet 41, which, by means of wheels 42 move along said rails 11. Arms 31 and joints 32 of pantograph 30 allow for uniform length variations of the retractable tunnel.

The bellow shaped retractable tunnel is also supported on its front part, by the supporting frame 60 of the scarfing head, said frame being supported by a carriage 61, provided with moving equipment.

On its rear part, which is fixed, the retractable tunnel

is secured to a wall, for example a plain concrete wall 43, through which the dust and smoke suction duct 44 goes, which terminates against said wall.

The operation is therefore very simple: when the tunnel is in its contracted position (see figure 2), slabs 70 to be scarfed are placed on base 10. As in its contracted position the tunnel according to the invention has an extremely short length, depending substantially on the size of feet 41 of supporting portals 40, the area of the base 10 available for the slabs 70 to be scarfed is used in the best way.

When the slabs 70 to be scarfed are arranged, the retractable tunnel 20 and the scarfing head 62 are pulled back to cover the slabs 70 which have just been arranged on base 10. The retractable tunnel 20 reaches here its maximum length (see figure 1).

The scarfing head 62 is then started, together with a fan, not shown in figure, which sucks in the smoke generated inside the tunnel, through duct 44 (see figure 1).

As the scarfing head 62 moves forward, the length of the tunnel 20 decreases until it reaches the final position shown in figure 2.

As the lower ends of the side walls of the tunnel move in the water contained in raceways 12, a perfect seal of the tunnel is obtained, preventing the dust and smoke from leaking through into the working area surrounding the tunnel.

The opening between the front part of the tunnel and the supporting and transporting structure of the head, does not allow for a flow of smoke as, due to said fan, through said opening a strong current of air flows in.

In figure 3 are shown the cleansing means for raceways 12: they consist of paddles 45 supported articulately by feet 41 of the mobile suspension portals of the tunnel.

Said paddles have a cross section which is substantially equal to the cross section of the raceways 12. If the working direction of the scarfing head is that shown by arrow F1, they are provided with pawl means preventing a rotation towards the right beyond the vertical position shown in the right part of figure 3: in this way, they gather the dust and deposits which settle on the bottom of raceways 12, and direct them to a system of collection tanks and hydroseparators indicated schematically with reference number 46.

As said paddles can freely rotate towards the left, with respect to figure 3, they scrape the upper surface of the deposits settled in raceways 12, during the return of the retractable tunnel from the position shown in figure 2 to the position shown in figure 1 (see arrow F2 in figure 3).

Therefore, raceways 12 are cleaned automatically and continuously.

With particular reference to figures 1, 2 and 4: in order to protect the retractable tunnel walls from the jets of red-hot material caused by the scarfing head work,

the latter is equipped with a side deflector 51, and with an upper deflector 52. Thus, the jets of red-hot material caused by the scarfing head work, are deviated in the longitudinal direction of the tunnel, so as to protect its side and upper walls.

Moreover, the part of the tunnel facing the scarfing head, is made of two suitably hardened iron sheets: an upper iron sheet "53", and a side iron sheet "54".

In this way, the jets of red-hot material which the deflectors 51 and 52 might have failed to intercept, would not touch the flexible walls of the tunnel bellow, but said protection iron sheets 53 and 54.

Deflectors 51 and 52, and iron sheets 53 and 54 are placed only on one side, in view of the fact that, as shown in figures 1, 2 and 4, the scarfing head faces downwards and sideways.

With particular reference to figures 5 and 6, they show the two possible positions of the guide rails 11 with respect to raceways 12, respectively 112.

The position of raceways 12, shown in figure 5, corresponds to the embodiment shown in figures 1, 2 and 4, with the retractable tunnel frame external to the tunnel itself.

Such solution has the advantage that the tunnel supporting structures are protected against dust and jets of molten metal and slag caused by the scarfing head.

The solution shown in figure 6, on the other hand, would allow for an increase of the distance between the tunnel walls and the slabs, thereby increasing the tunnel wall durability.

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Claims

1. Device to collect and dump the smoke and dust generated during a scarfing operation, particularly of slabs, and other metallurgical, unfinished products, of the type providing a supporting bench for the slabs to be scarfed and a scarfing head, sliding on rails along said bench, in which suction means for the smoke and dust generated during the scarfing operation are also provided, and characterized by the fact that it provides a retractable tunnel, preferably in the shape of a bellow, secured on one of its ends to one end of said bench, where the suction duct of a smoke exhaust fan is located, and on its other end integral in its movement to a scarfing head, wherein suitably supporting means for said retractable tunnel are located at pre-set spaces along the tunnel.

2. Device, according to the previous claim, characterized by the fact that said bellow shaped retractable tunnel is provided with hardening frames with the shape of an upside down U, located at pre-set spaces, along whose sides the trunnions slide vertically, trunnions which are placed on the ends of the arms of a pantograph, secured, on one of its ends, to the fixed securing element of said tunnel, and, on its other side, to the supporting and transporting structure of the scarfing head.

3. Device, according to the previous claims, characterized by the fact that said tunnel is suspended from one or more portals, sliding on rails or pulled by the articulated joints of the arms of said pantograph.

4. Device, according to the previous claims, characterized by the fact that the lower parts of the retractable tunnel

side walls project into two raceways filled with water, so as to create a hydraulic seal.

5. Device, according to the previous claims, characterized by the fact that said sliding portals are equipped with inclinable paddles which, when the tunnel is contracting, scrape the bottom of said raceways, removing the deposits, while, when the tunnel is expanding, fold back freely upwards, so as to drag the deposits from said raceways in one direction only.

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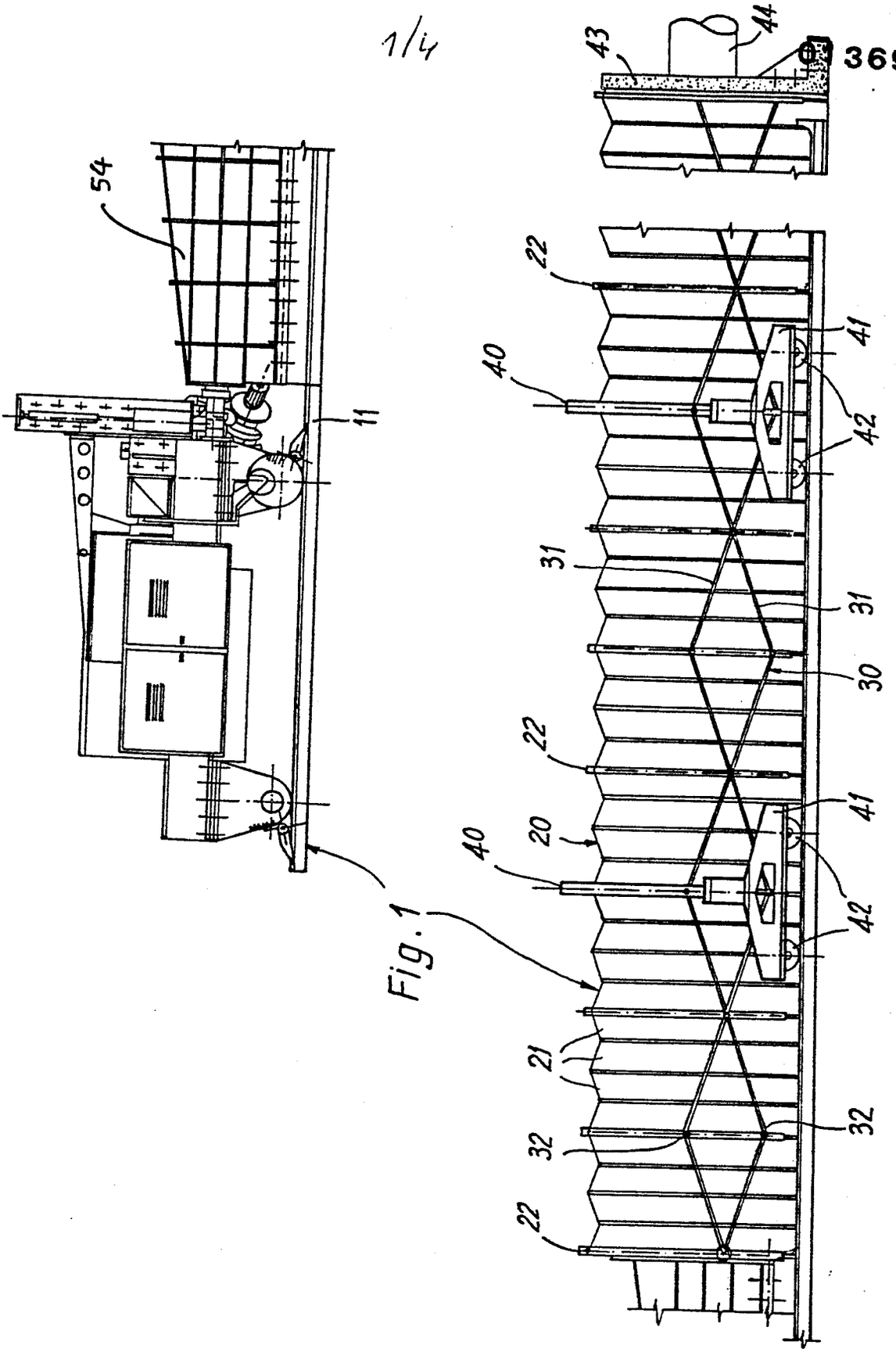

Fig. 1

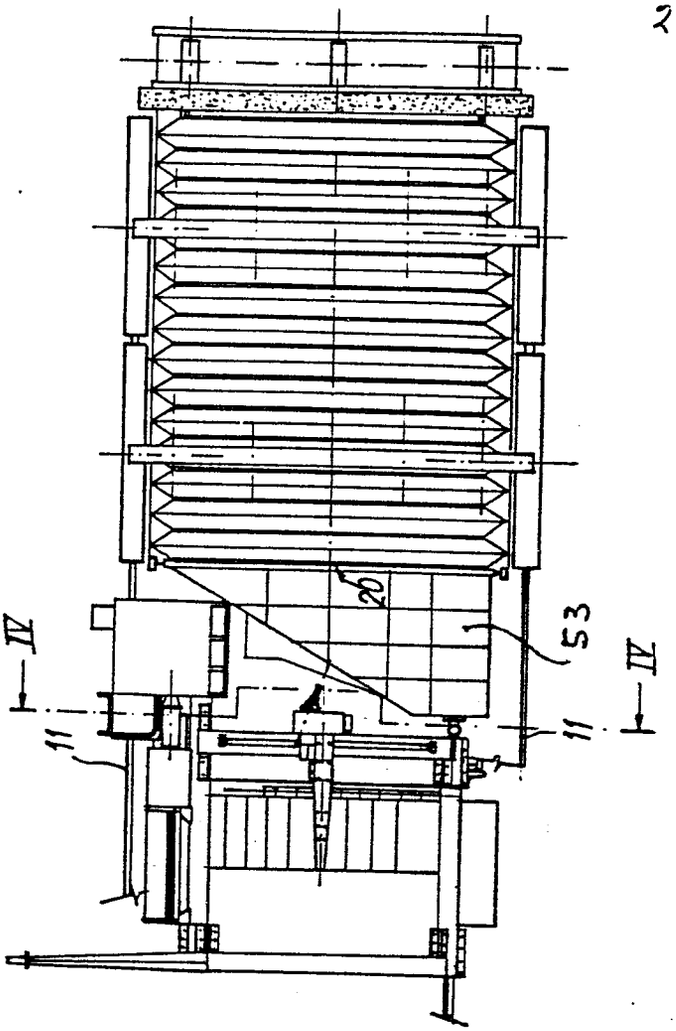

Fig. 2

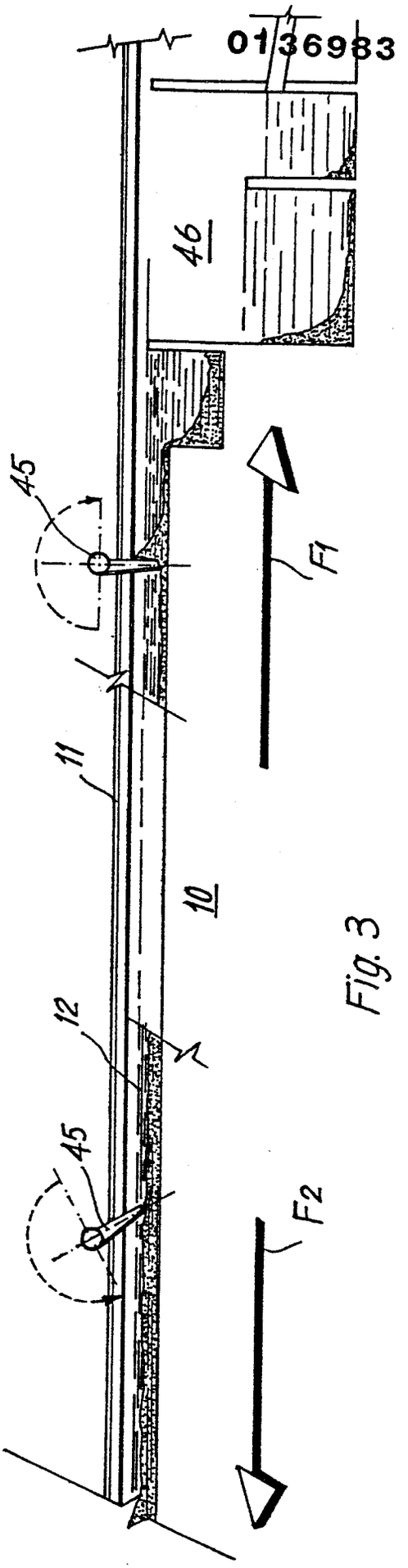

Fig. 3

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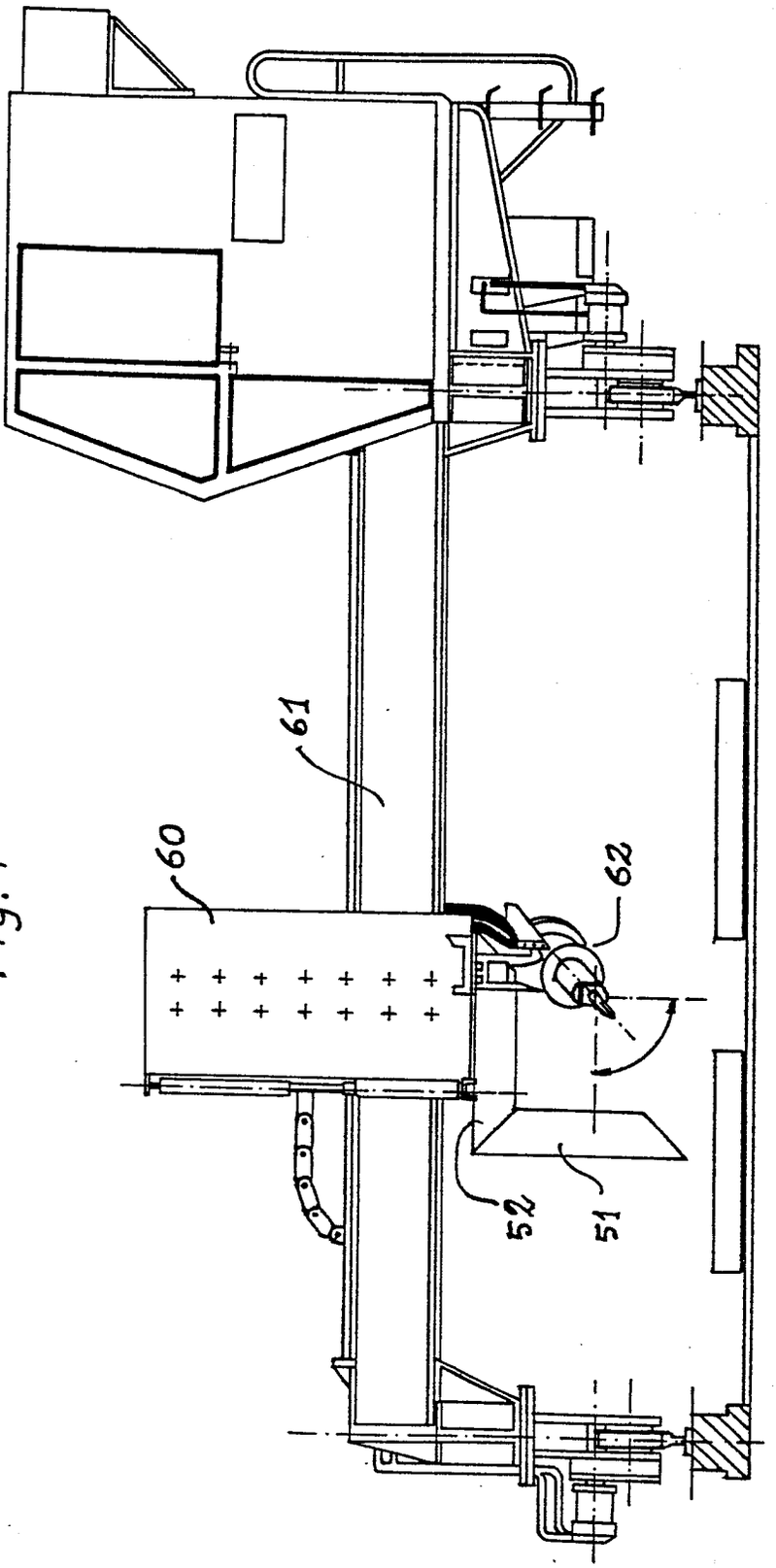

Fig.4

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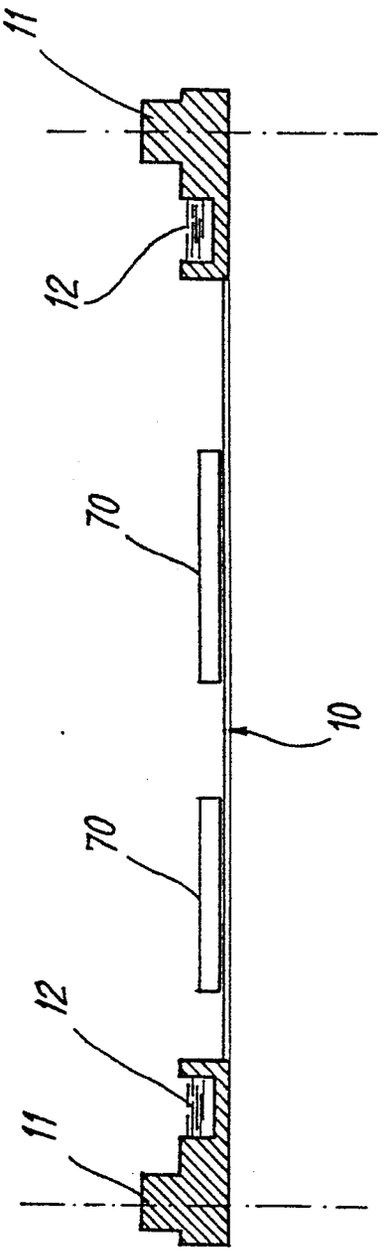

Fig. 5

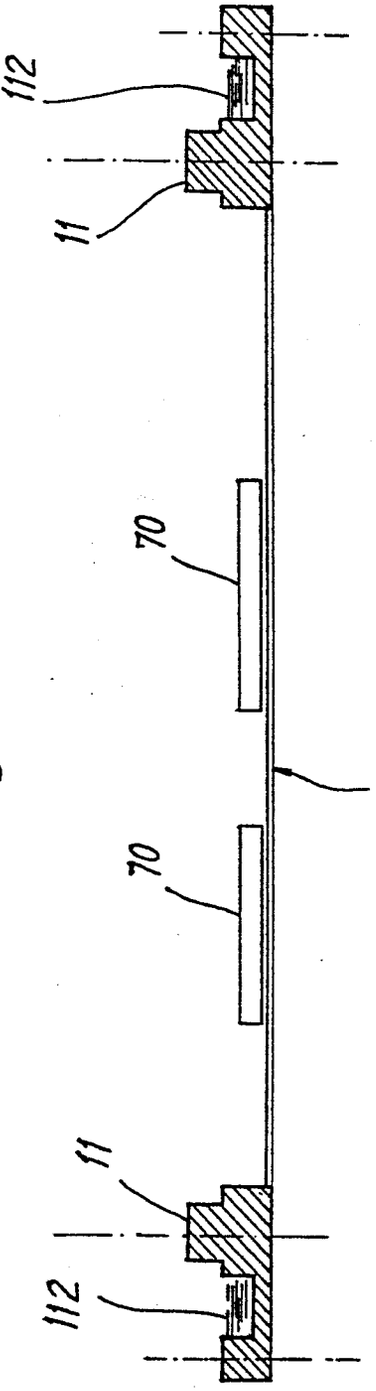

Fig. 6