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(54) Sheet glass drawing plant

(57) To clear the space under the glass roller way mechanically, relatively quickly, there are arranged under the glass roller way a plurality of flat troughs (15) alongside each other, transverse to the conveying direction of the sheet glass strip (11), which troughs are formed as collecting and conveying devices for the waste sheet glass pieces, are combined in a battery, which can be individually moved to and fro with alternately differing velocities, whereby the collected waste sheet glass pieces are fed out in jerks sideways under the glass roller way. In this each flat trough (15) can be braked abruptly at the end of its movement in the one direction by abutment supports with rubber buffers. Deflectors over the flat troughs (15) prevent waste sheet glass pieces falling down to the ground through the spaces between adjacent flat troughs (15).

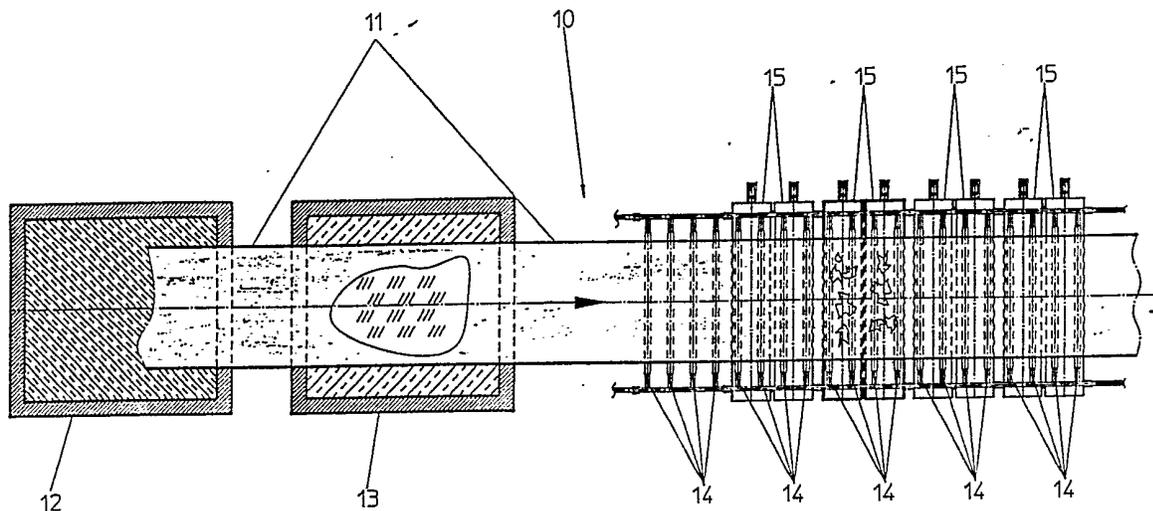


Fig. 1

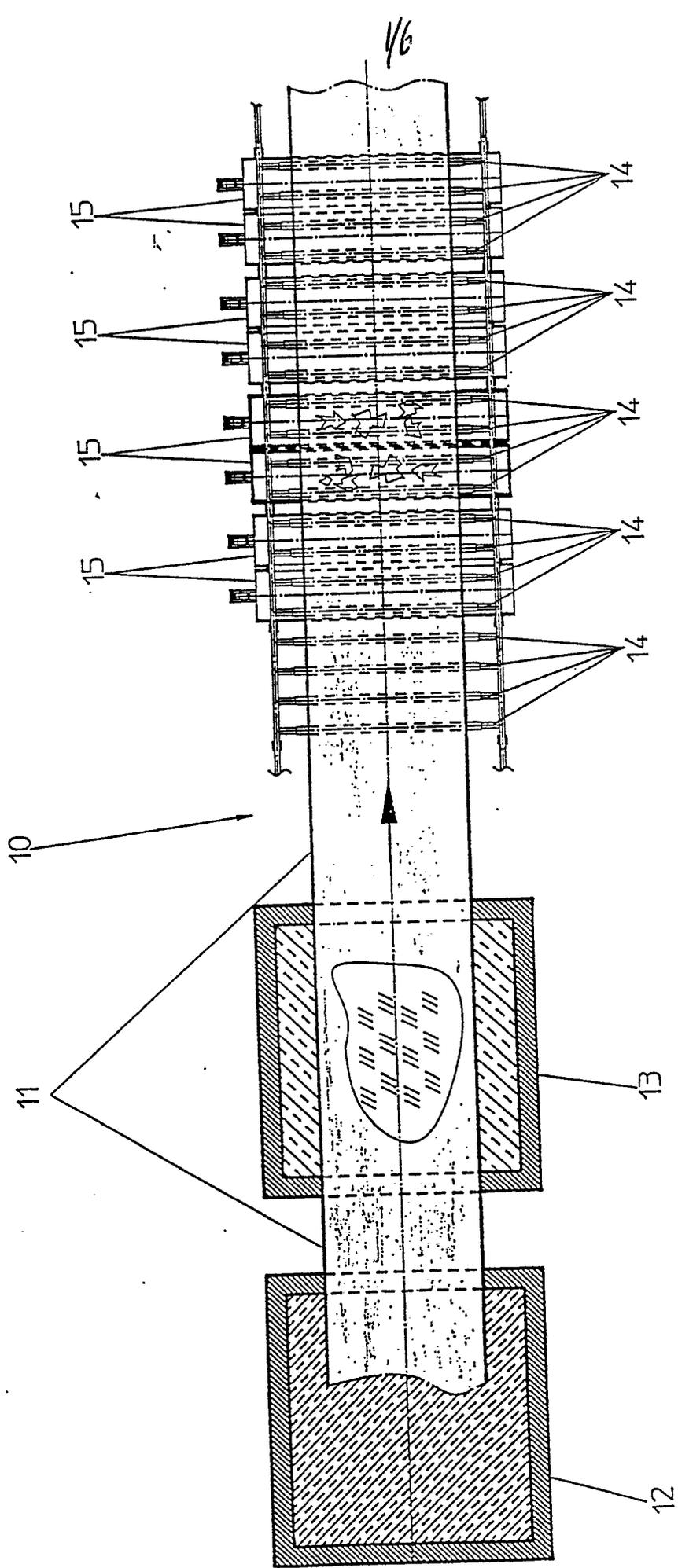


Fig. 1

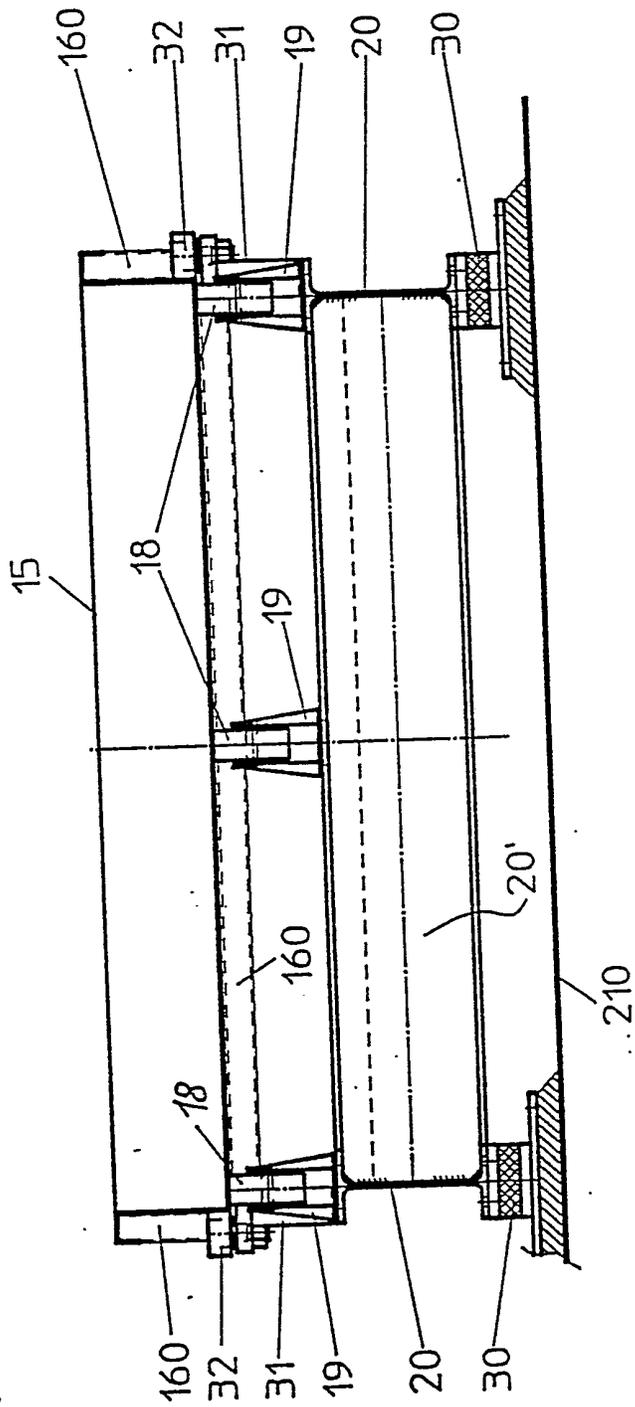


Fig. 2

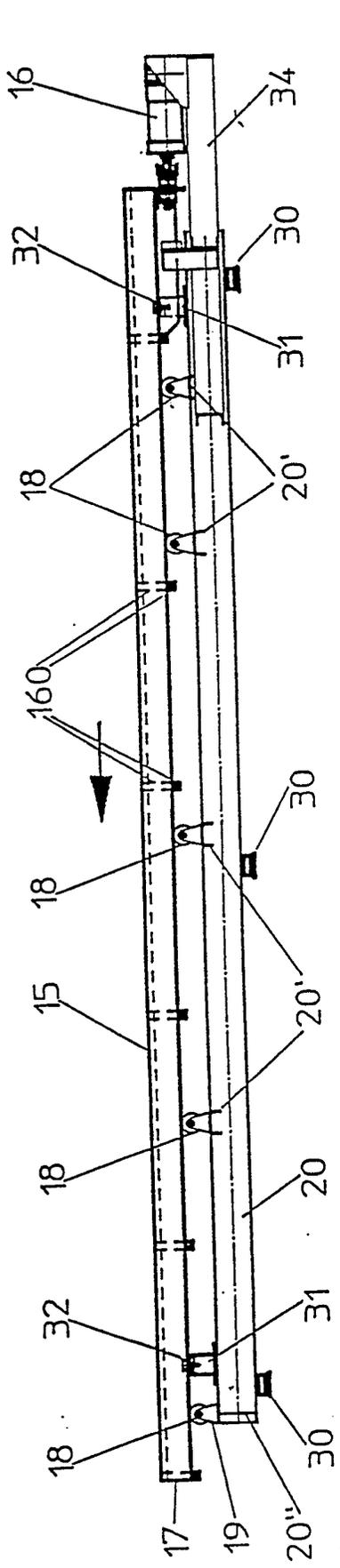


Fig. 3

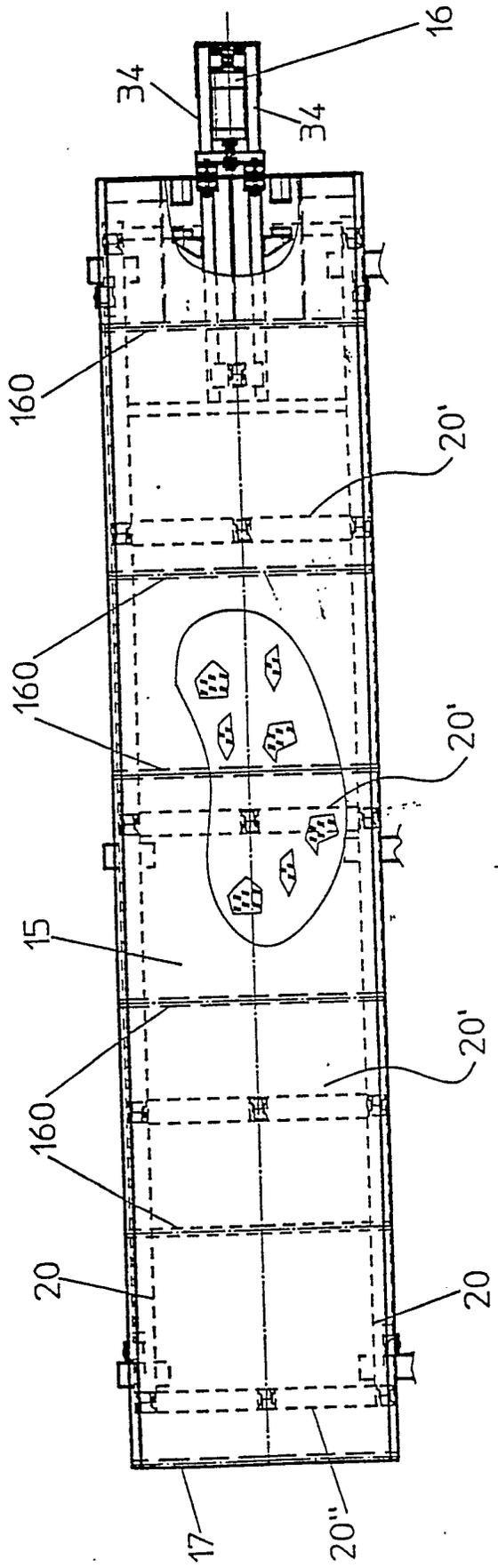


Fig. 4

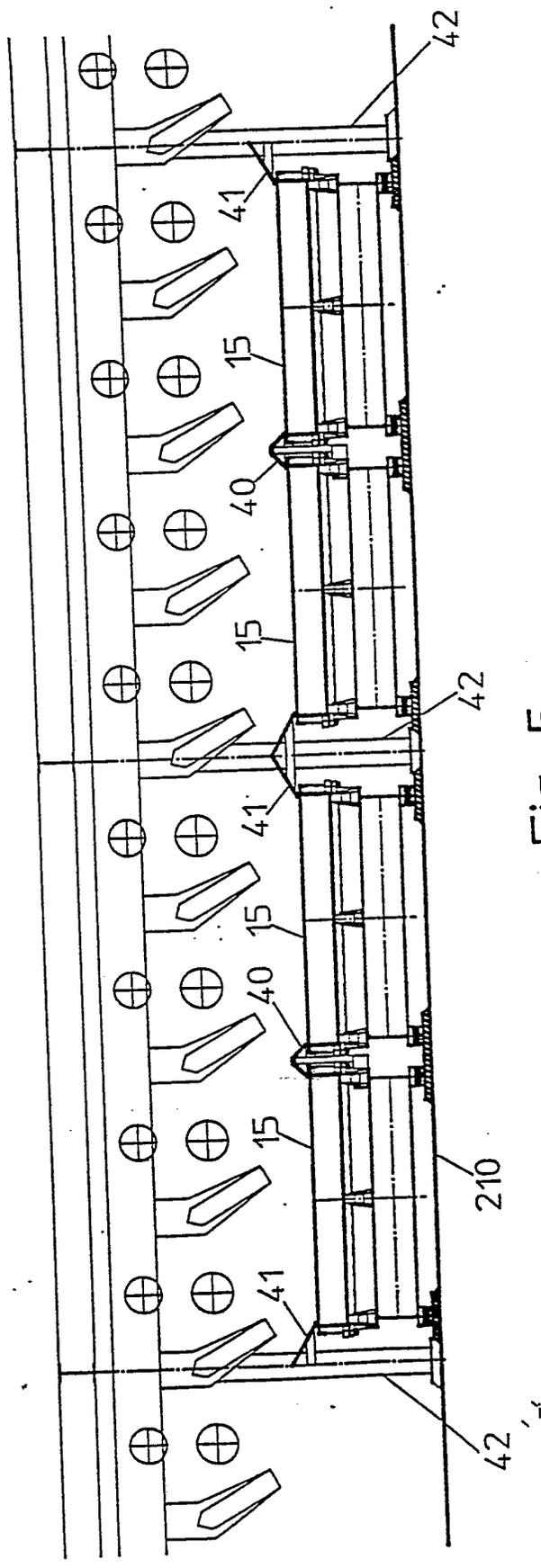


Fig. 5

Fig. 6

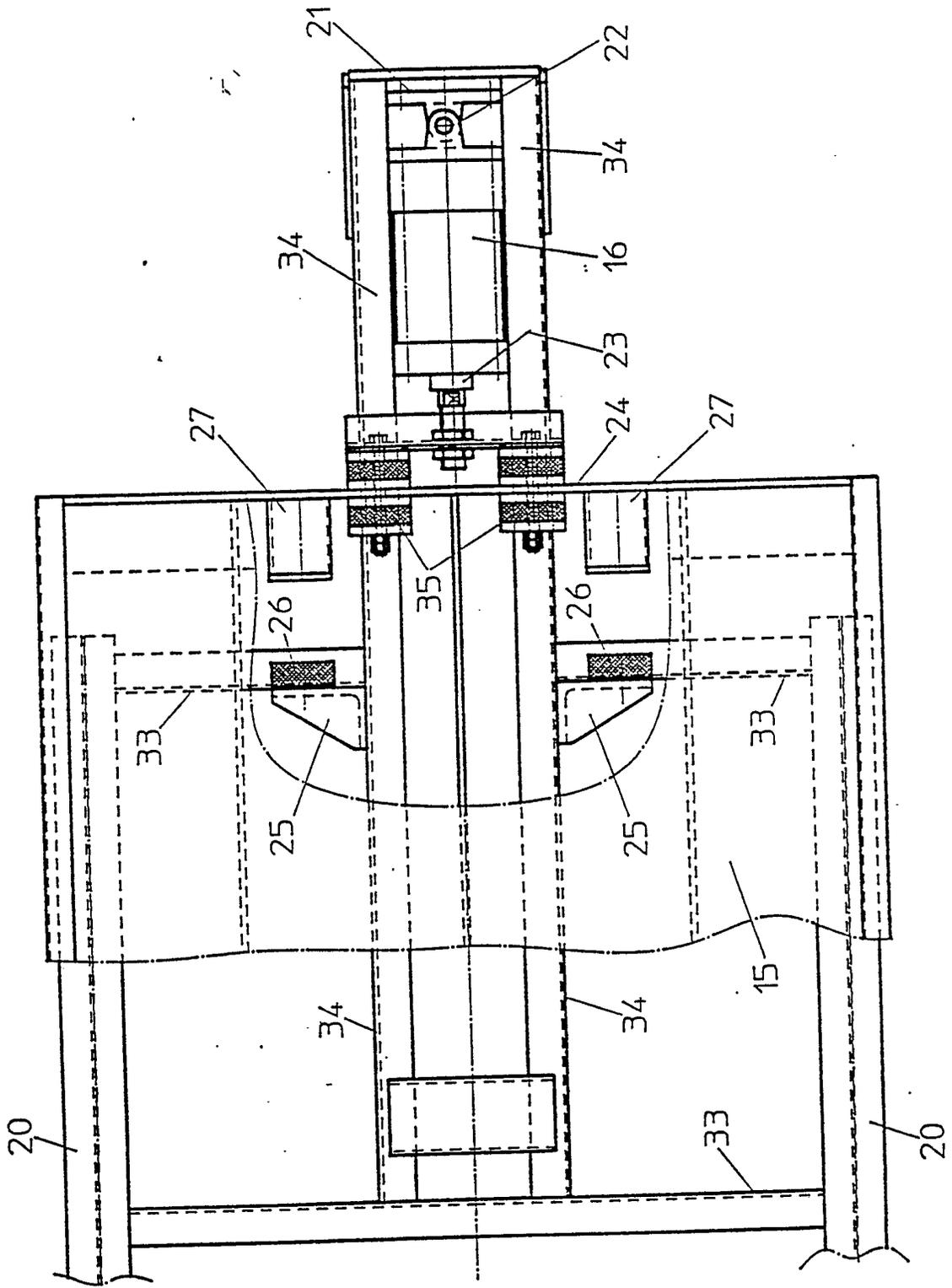
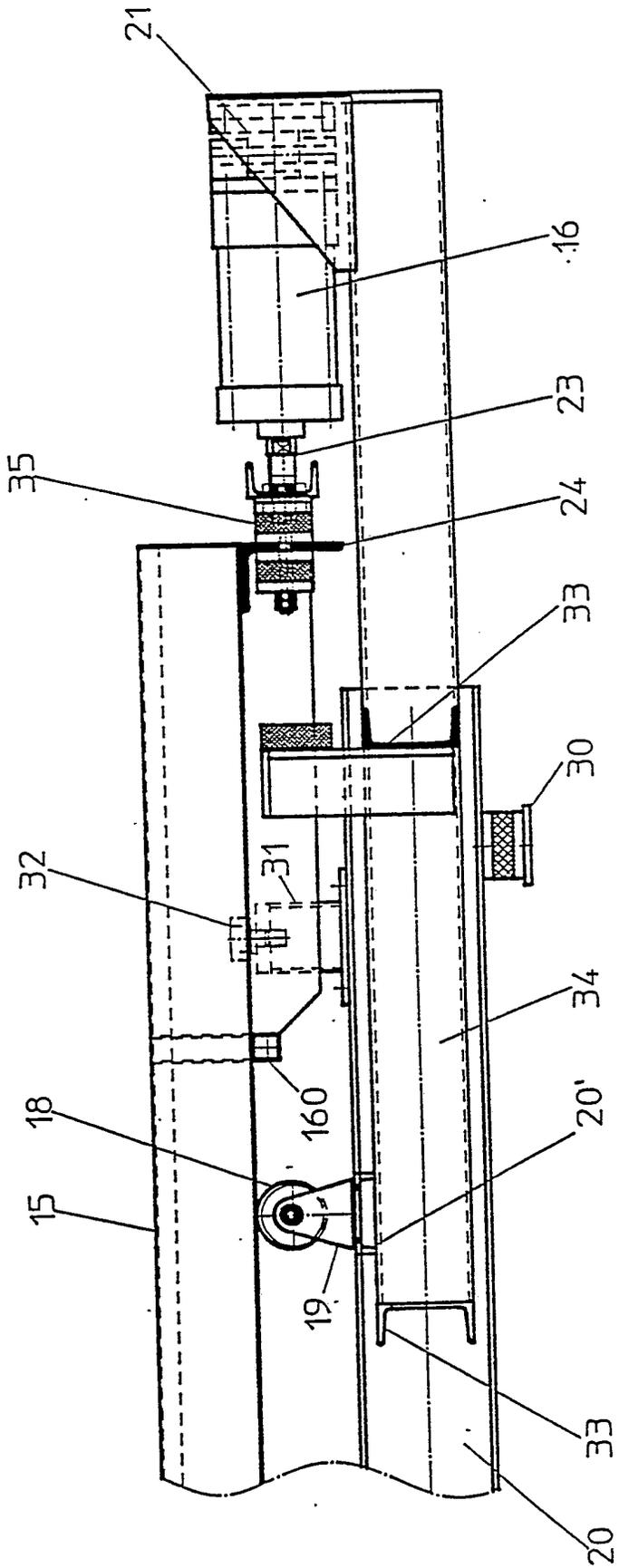


Fig. 7



Sheet Glass Drawing Plant

This invention relates to a sheet glass drawing plant with a glass roller way for a sheet glass strip, comprising numerous rollers spaced from one another, regarded in the conveying direction of the sheet glass strip.

5 The glass roller way of such sheet glass drawing plants are as a rule arranged only a relatively small distance (about 80 cm) from the floor and the height of the free space below the glass roller way is therefore correspondingly small. The confined space below the glass roller way makes the removal of the broken sheet glass pieces or glass waste, which falls to the ground between the rollers of the glass roller way, extremely difficult and dangerous. Hitherto the removal of this glass waste has been carried by hand, which is very unpleasant for the workers on account of the hot surroundings, quite apart from the resultant high personnel costs and the time pressure under which this work has to be carried out. During the operation of the sheet glass drawing plant the sheet glass strip is in fact drawn off continuously and fed to the glass roller way and it can easily happen that faults in the strip, e.g. tears or inclusions can at times pile up. It can then be very difficult for the workers to remove the glass waste falling under the glass roller way quickly enough.

Known, conventional conveyor means are not suitable as a solution to the above problem on account of the limited available structural height as well as on account of the high temperature of the waste material (about 180° C). Account must also be taken of the fact that the sharp broken edges of the waste material act as cutting edges as the waste glass pieces fall and would destroy e.g. conventional conveyor belts in the shortest of times. However even conveyor belts of metal sheets hinged together are not suitable for the solution of this particular removal problem, since the falling waste glass pieces could wedge between the individual sheets. Moreover in fitting mechanical removing means care must be taken that these do not transmit any vibrations to the floor, since there is otherwise the danger that the manufactured glass strip will exhibit undesired "chatter marks".

35 The invention is based on the problem of so mechanising the clearing of the space below the glass roller way of waste sheet glass

pieces that these are fed relatively rapidly laterally out of the said space below the glass roller way. In this transmission of vibrations to the ground is also to be avoided, as is excessive wear of the conveying elements used for this.

- 5 According to the invention the above problem is solved in that
- a) a plurality of flat troughs open at least one end are arranged below the glass roller way transverse to the conveying direction of the sheet glass strip as collecting and conveying devices for broken sheet glass pieces falling down between the rollers of the glass roller way,
 - 10 b) the flat troughs are adapted to be driven to and fro with alternately differing velocities, in order to convey the collected sheet glass pieces by jerks in the direction of the open ends of the flat troughs located beside a longitudinal edge of the glass roller way and
 - 15 c) each flat trough can be braked abruptly by a buffer device at the end of its motion in the one direction.

Such collecting and conveying devices formed as flat troughs for broken sheet glass pieces can be made with such a small structural height that they can be installed also in the confined space below a glass roller way, and moreover in the form of a battery of flat troughs which can extend over a major part of the glass roller way. The waste glass pieces are conveyed by these flat troughs laterally out of the space below the glass roller way, and fall off the open ends of the flat troughs into suitable collecting containers or conveying installations, which then feed the waste glass pieces to the glass melting pan for re-melting. The flat troughs are subjected only to relatively little wear on account of the relatively small conveying velocity and the danger is moreover slight that the waste glass pieces destined for re-melting will be contaminated in these flat troughs by metal, which could create undesired colour casts in the glass. Through the battery of flat troughs according to the invention beneath the glass roller way, waste sheet glass pieces are accordingly rapidly removed over a relatively large area. This relatively rapid removal is necessary since, in the narrow space beneath the glass roller way, further broken material can fall in practically uncontrolled quantities. A further advantage of the invention is that practically no disturbing vibrations are transmitted

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to the ground beneath the sheet glass drawing plant by the flat troughs acting as collecting and conveying devices, which could lead to "chatter marks" in the manufactured glass strip.

5 Developments of the invention appear from the sub-claims. Thus the spaces between adjacent flat troughs are advantageously so covered over by deflectors that sheet glass pieces falling thereon are diverted into one or the other of the adjacent flat troughs.

10 According to another development of the invention the deflectors can be fixed to the supports for the glass roller way and overlap the sidewalls of the flat troughs at their upper edges. This is a particularly simple structural solution, in order to ensure that the falling waste sheet glass pieces get with certainty into the flat troughs.

15 According to another embodiment of the invention, each flat trough is driven by its own pneumatic cylinder, whose piston rod is connected centrally to an end of a flat trough, the pneumatic cylinder being controlled by magnetic valves. This kind of drive is particularly free from wear and requires no expensive synchronisation.

20 Preferably the flat troughs are mounted on freely rotatable support rollers. These support rollers preferably consist of sheet steel rollers with ball bearings.

According to a further development of the invention, lateral guide rollers can be provided for each flat trough.

25 The buffer device for each flat trough advantageously comprises at least two abutment supports arranged laterally spaced from one another, which each carry at least one rubber buffer, which cooperate with one or more stops on each flat trough, the stops being arranged near to the point of action of the pneumatic cylinder. These stops are thus located in the immediate vicinity of the point of introduction of force into the flat trough by the pneumatic cylinder.

30 The support rollers and if applicable the lateral guide rollers as well as the abutment supports of the buffer device can be fixed on a sub-structure associated with each flat trough, to which sub-structure the pneumatic cylinder can also be connected.

35 The invention will now be explained with reference to the drawings of an embodiment. These show:

- Figure 1 a schematic plan view of a part of a sheet glass drawing plant with a glass roller way, beneath which is arranged a battery of flat troughs, which serve in accordance with the invention as collecting and conveying devices for waste sheet glass pieces;
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- Figure 2 an end view of a flat trough with its supporting sub-structure;
- Figure 3 a side view of a flat trough with sub-structure and a pneumatic cylinder as drive for the flat trough;
- 10 Figure 4 a plan view of the flat trough of Figures 2 and 3;
- Figure 5 an end view of a some adjoining flat troughs arranged beneath the glass roller way, with their adjacent longitudinal edges being covered over by deflectors with peaked cross-section;
- 15 Figure 6 a plan view of a part of a flat trough and its sub-structure at the drive end and
- Figure 7 a side view of the part of the flat trough shown in Figure 6, with sub-structure.

In the plan view of Figure 1 there is shown a part of a sheet glass drawing plant 10, in which sheet glass is made continuously by the float method. The sheet glass strip 11 emerging from the glass melting pan 12 runs therein firstly over a bath 13 of molten metal, preferably tin, and passes therefrom on to the so-called glass roller way, which comprises a plurality of freely rotatable rollers 14 arranged mutually spaced from one another, for supporting the sheet glass strip 11 moving in the direction of the arrow. The glass roller way can have a length of e.g. 60 m or more. The width of the sheet glass strip 11 amounts as a rule to about 4 m and it has a thickness of about 2 - 20 mm.

Pieces of the sheet glass strip 11 damaged or unusable e.g. through tears or inclusions are fed down between the rollers 14 and these waste sheet glass pieces have hitherto collected on the floor

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under the glass roller way and then have to be laboriously removed manually, which is very difficult on account of the heat and the small structural height of the glass roller way of about 80 cm.

According to the invention numerous flat troughs 15 are arranged
5 beneath the glass roller way relatively close to each other transverse to the conveying direction of the sheet glass strip 11 for the removal of this glass waste. These flat troughs 15 serve advantageously at the same time as collecting and conveying devices for the broken sheet glass pieces falling down between the rollers 14, whereby a two-dimensional
10 clearing of this glass waste from the space under a part of the glass roller way is achieved. To this end each flat trough 15 is moved to and fro by its own pneumatic cylinder 16 (Figure 3), with alternately differing velocities. The waste sheet glass pieces in the flat troughs 15 are thus conveyed by jerks in the direction of an open end 17 of each
15 flat trough 15, where they can be caught and transported back to the glass melting pan by means of conventional transport and/or auxiliary means. The number of the flat troughs 15 assembled into a battery is determined according to the existing requirements for an areal clearing of the space under the glass roller way of this glass waste. As a rule
20 about 14 of the flat troughs 15 according to the invention suffice, with e.g. a width of 1.40 m and a length of 6.50 m. The flat troughs 15 of such a battery below a glass roller way are alike, including their drive, and it therefore suffices to describe one such in detail with reference to Figures 2 - 7.

25 The flat trough 15 shown in Figures 2 - 7 consists of bent up sheet steel and is stiffened at its sides and also on its under-side by square tubes 160. The flat trough 15 open at the left end 17 according to Figures 3 and 4. This open end 17 thus forms the delivery or exit end for the waste sheet glass pieces. The flat trough 15 is supported in the
30 embodiment on three rows of support rollers 18. The support rollers 18 are for their part each freely rotatable in a bearing block 19. The bearing blocks 19 of the two outside rows are fixed on I-section bars 20 and the bearing blocks 19 of the middle row on cross-members of U-section bars 20'. The U-section bars 20' are welded at their ends to the
35 I-section bars 20 and the left ends, according to Figures 3 and 4, of the I-section bars 20 are connected together by an I-section bar 20". The I-section bars 20, 20" and the U-section bars 20' in each case form

a supporting sub-structure for a flat trough 15, the I-section bars 20 being anchored to the floor 210 below the glass roller way of the sheet glass drawing plant involved through bonded rubber mounting blocks 30.

Furthermore bearing blocks 31 are fixed on the two I-section bars 20, to carry freely rotatable lateral guide rollers 32 for the flat trough 15.

As already mentioned above, the two I-section bars 20 are connected at their left ends according to Figures 3 and 4 by the I-section bars 20" and at their right ends by a cross-bracing of U-section bars 33, on which are fixed two longitudinally running U-section bars 34. At the outer ends of these U-section bars 34 there is fixed a perpendicular bearing element 21, to which the pneumatic cylinder 16 is pivoted at 22. The piston rod 23 of the pneumatic cylinder 16 is fixed centrally through rubber mounting blocks 35 to a transversely running section bar 24 at the one end of the flat trough 15.

An abutment support 25, which carries a rubber buffer 26, is fixed on each of the right, according to Figures 6 and 7, transversely running U-section bar 33 and the longitudinally running U-section bar 34. The abutment supports 25 are aligned laterally with one another and their rubber buffers 26 cooperate in the embodiment with stops 27, which are fixed on the underside of the flat trough 15. The I-section bars 20, 20", the U-section bars 20' and 33, 34 thus form a supporting sub-structure for the support rollers 18, lateral guide rollers 32, abutment supports 25 and the pneumatic cylinder 16.

The control device for the pneumatic cylinder 16 comprises two magnetic valves (not shown) connected one to each side of the pneumatic cylinder 16.

In order that the waste sheet glass pieces falling down between the rollers 14 of the glass roller way cannot get between adjacent flat troughs 15 down on to the ground 210 under the glass roller way, the space between adjacent flat troughs 15 is covered over by deflectors 40 separate from the flat troughs 15, with peaked cross-section (Figure 5). An outer longitudinal edge of the flat trough 15 of each flat trough pair is overlapped by a deflector 41, which consists e.g. of a suitably inclined piece of sheet metal. The deflectors 40, 41 are fixed on the supports 42 of the glass roller way of the sheet glass drawing plant in question.

The structural height of the flat troughs 15 lies around only 60 - 70 cm, including their supporting sub-structure.

Claims

1. Sheet glass drawing plant with a glass roller way for a sheet glass strip, comprising numerous rollers spaced from one another, regarded in the conveying direction of the sheet glass strip,
5 characterized in that
 - a) a plurality of flat troughs open at least one end are arranged below the glass roller way transverse to the conveying direction of the sheet glass strip as collecting and conveying devices for broken sheet glass pieces falling down between the rollers of the
10 glass roller way,
 - b) the flat troughs are adapted to be driven to and fro with alternately differing velocities, in order to convey the collected sheet glass pieces by jerks in the direction of the open ends of the flat troughs located beside a longitudinal edge of the glass
15 roller way and
 - c) each flat trough can be braked abruptly by a buffer device at the end of its motion in the one direction.

2. Sheet glass drawing plant according to claim 1, characterized in that the spaces between adjacent flat troughs are so covered over by
20 deflectors that sheet glass pieces falling down are diverted into one or the other of the adjacent flat troughs.

3. Sheet glass drawing plant according to claim 2, characterized in that the deflectors are fixed to the supports for the glass roller way and overlap the sidewalls of the flat troughs at their upper edges.

- 25 4. Sheet glass drawing plant according to claim 1, characterized in that each flat trough is driven by its own pneumatic cylinder, whose piston rod is connected centrally to an end of a flat trough, the pneumatic cylinder being controlled by magnetic valves.

5. Sheet glass drawing plant according to claim 1, characterized in
30 that the flat troughs are mounted on freely rotatable support rollers.

6. Sheet glass drawing plant according to claim 1, characterized in that lateral guide rollers are provided for each flat trough.

7. Sheet glass drawing plant according to claim 1, characterized in that the buffer device for each flat trough comprises at least two abutment supports arranged laterally spaced from one another, which each carry at least one rubber buffer, which cooperate with one or more stops
5 on each flat trough, the stops being arranged near to the point of action of the pneumatic cylinder.

8. Sheet glass drawing plant according to one of the preceding claims, characterized in that the support rollers and if applicable the lateral guide rollers as well as the abutment supports of the buffer
10 device are fixed on a sub-structure associated with each flat trough, to which sub-structure the pneumatic cylinder can also be connected.