

PATENT SPECIFICATION

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(54) AN APPARATUS AND METHOD FOR THE RECOVERY OF
 LEAD FROM LEAD/ACID BATTERIES

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SPECIFICATION NO 1412295

The following corrections were allowed under Section 76 on 24 August 1976

Sheet 7 of drawings

for existing Fig 10a and 10b of drawings read

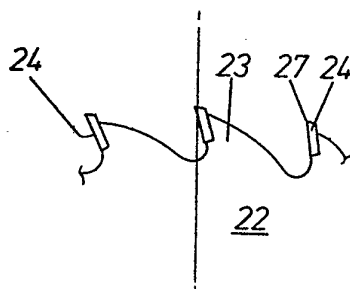


Fig. 10a

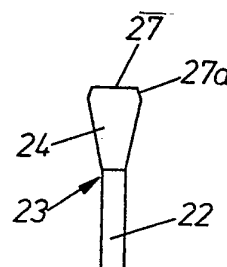


Fig. 10b

THE PATENT OFFICE
 16 September 1976

Bas 31109/11

plates.

A preferred embodiment of the present invention is hereinafter particularly described with reference to the accompanying drawings, in which:—

40 Figure 1 is a schematic plan view of an apparatus according to the present invention,

Figure 2 is a schematic side elevational view taken along line 2-2 in Figure 1,

45 Figure 3 is a schematic side elevational view of a tooth 23 mounted on a blade 22.

[Price 33p]

DESCRIPTION OF DRAWINGS

The conveyor 11 transports each battery to a separating station 16 whereat a circular saw 3 is located which is operable to separate the normally top side 17 of the battery on which the terminals are 85 mounted from the casing part 18.

The blade 22 of the circular saw 3 is shown in greater detail in Figures 10a and 10b. Tooth 23 comprises a hardened portion 24, formed for example from tungsten 90

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(54) AN APPARATUS AND METHOD FOR THE RECOVERY OF
 LEAD FROM LEAD/ACID BATTERIES

(71) I, LEON WORONOWSKI, a British Subject of 27, Cleve Avenue, Toton, Notts, do hereby declare the invention, for which I pray that a Patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to an apparatus and method for the recovery of lead from lead/acid batteries.

According to one aspect of the present invention there is provided an apparatus for the recovery of lead from lead/acid batteries including a separating station, feed means for supplying batteries to the separating station, saw means at the separating station serving to cut each battery arriving thereat into two parts, a first part containing battery terminals and the second part containing the battery plate, and locating means at the separating station for locating each battery arriving at the separating station at a predetermined position in relation to the saw means prior to cutting.

According to a further aspect of the present invention there is provided a method for the recovery of lead from lead/acid batteries comprising the step of feeding batteries to a separating station whereat each battery is cut into two parts, a first part containing the battery terminals and the second part containing the battery plates.

A preferred embodiment of the present invention is hereinafter particularly described with reference to the accompanying drawings, in which:—

Figure 1 is a schematic plan view of an apparatus according to the present invention,

Figure 2 is a schematic side elevational view taken along line 2-2 in Figure 1,

Figure 3 is a schematic side elevational

view taken along line 3-3 in Figure 1 showing the crushing device in greater detail,

Figure 4 is a schematic side elevational view of the apparatus taken along line 4-4 in Figure 1

Figure 5 is a plan view of the part of the apparatus shown in Figure 4

Figure 6 is a front elevational view of the part of the apparatus shown in Figure 4 and 5

Figure 7 is a front elevational view of the locating and holding device

Figure 8 is a plan view of the device of Figure 7

Figure 9 is a side elevational view of the device of Figure 7 and 8

Figures 10a and 10b are front and side elevational views of a portion of a blade according to the present invention.

Figure 11 is a schematic side elevational view of a washing device according to the present invention.

Figure 12 is a schematic side elevation view of a draining device according to the present invention.

Referring to the drawings, an apparatus according to the present invention is generally shown at 10. The apparatus 10 shown in Figure 1 comprises a slat conveyor 11 which transports car batteries 12 from a loading station 13 to a discharge station 14. The slat conveyor 11 has a plurality of projections 11a which serve to engage the rear most side of the battery in the direction of travel.

The conveyor 11 transports each battery to a separating station 16 whereat a circular saw 3 is located which is operable to separate the normally top side 17 of the battery on which the terminals are mounted from the casing part 18.

The blade 22 of the circular saw 3 is shown in greater detail in Figures 10a and 10b. Tooth 23 comprises a hardened portion 24, formed for example from tungsten

carbide. The blade 22 is about 24 inches in diameter and carries a plurality of teeth, the pitch between each adjacent tooth being about 105 mm. Each tooth has an under cut angle of about 15° and a clearance angle of 10°. As seen more clearly in Figure 10b each tooth is tapered in cross-section the taper extending radially inwards of the blade 22. Preferably, each tooth is 4mm wide at its widest point. Each tooth is provided with a cutting edge 27 which lies in a plane extending radially of the blade and which is parallel to the axis of rotation of the blade. Preferably, each tooth is bevelled at each of its cutting edge at 27a which facilitates the cutting action of the saw blade.

In order to maintain a battery 12 being conveyed along conveyor 11 in a predetermined position in relation to the saw blade 22 there is provided a locating device 100 which is illustrated in greater detail in Figures 7, 8 and 9. The device 100 includes a guide plate 101 which is mounted on the conveyor frame 102 so as to extend along the conveyor 11. A locating bar 104 is connected to frame 102 by a link arrangement 105 so as to be movable toward and away from the guide plate 101. The link arrangement 105 includes a pair of arms 107, 108 which are each pivotally connected at one end to the locating bar 104 and the other end is connected to shafts 109 and 110 respectively. Shafts 109 and 110 are rotatably mounted in respective journals 111 and 112 which are in turn connected to the frame 102, as shown in Figure 7. Shaft 109 carries an arm 114 which is connected at its end remote from shaft 109 to the frame 102 via a spring 116. The spring 116 then biases the locating bar 104 towards the guide plate 101.

A further locating bar 120 is carried by a support 121 so as to be disposed above and to extend along the conveyor 11. The locating bar 120 is connected to the support via a pair of arms 122, 123 which are each pivotally connected at one end to the bar 120 and at the other end to support 121. The locating bar 120 is thus movable toward and away from the conveyor and by virtue of its own weight is biased towards the conveyor 11.

Thus as a battery 12 is conveyed along the conveyor 11 on its side it contacts the locating bars 104 and 120 which are both moved against their respective bias. In consequence as seen in Figure 8 the battery terminals are made to bear against the guide plate 101 by locating bar 104 and is held firmly on the conveyor by virtue of locating bar 120. Accordingly, when the battery 12 contacts the blade 22, the cut of the blade is accurately disposed in relation to the battery 12 and the battery is pre-

vented from rising from the conveyor 12.

A dust extractor 9 is provided above the saw blade 22 to remove dust and the like resulting from the cutting operation.

On completion of the cutting operation the top portion 17 is allowed to fall under gravity on to a second conveyor 19 which transfers the top portion 17 to a separating station 20 whereat the terminals and other metal parts which are normally antimony lead are separated from the remainder of the top portion 17. The separation is effected in a mechanical crushing unit 30 which is shown in detail in Figures 2 and 3. As shown in Figures 2 and 3 the top portions 17 are fed by the conveyor 19 to the feed chute 31 of the crushing unit 30. The top portions 17 then fall under gravity into the unit 30 and between two side by side counter-rotating rollers 33 and 34. Each roller is provided with a plurality of radially extending projections 35 which are so positioned that the projections 35 on one roller extend into the interstices defined by the projections on the other roller and vice versa.

The crushed material falls under gravity into a duct 36 along which a stream of air 35 is directed. The duct 36 is inclined to the horizontal and the air stream is directed up the incline so that the lighter fraction of the crushed material is directed up the incline to an outlet 38 whereat the lighter material is allowed to fall under gravity into a storage bin (not shown). The heavier fraction of material falls down the incline of the duct 36 against the air stream and falls under gravity through an outlet 39 into a storage bin (not shown).

The casing portion 18 containing the lead plates of the battery 12 is carried by the conveyor 11 to the discharge station 14. At the discharge station 14 each casing portion 18 is transferred by a deflection plate 40 onto a platform 41 of a plate removal device 42 which is shown in greater detail in Figures 4, 5 and 6. A ram 40a is provided to enhanced the transfer of the portion 18 onto the platform 41.

Each casing portion 18 is transferred on to platform 41 so that the open side 46 is facing towards the left as shown in Figure 4. The casing portion 18 is then clamped in position by a clamping plate 47 which is actuated by a ram 48. Both the ram 48 and platform 41 are mounted on a pair of arms 49 which are each pivotally mounted at an end remote from the platform to the frame 50 of the apparatus.

Removal of the plates from a casing portion 18 is effected by moving the arms 49 about their horizontal pivot in an anti-clockwise direction as seen in Figure 4 to a lower most position.

Such movement of the arms 49 is

limited by a stop 51 which serves to suddenly stop the movement of the arms 49 carrying the casing portion 18. The shock of suddenly stopping causes the plates in the casing part 18 to be thrown onto an underlying conveyor 53. The stop 51 has a shock absorbing portions 51a preferably formed from a suitable resilient material such as rubber. The plates 54 may then be transported to a collection point (not shown).

Whilst platform 46 and arms 49 are in the lowermost position the ram 48 releases the clamping plate 47 and a further ram 55 urges the casing portion 18 from the platform 41 and onto a conveyor 60 which transports the casing portions 18 to a collection point.

Additionally, the separated plates 54 and casing 18 may be washed to remove traces of acid before reaching their respective collection points.

A suitable washing device 70 for washing the casings 18 is illustrated in Figure 11. The device 70 comprises a chamber 71 located beneath the conveyor 60 and houses a series of jets 72 which direct streams of water in an upward direction through the conveyor 60 and into the casing 18 which are positioned on conveyor 60 with their open side facing in a downwards direction.

The washings returning from the casings

WHAT I CLAIM IS:—

1. An apparatus for the recovery of lead from lead/acid batteries including a separating station, feed means for supplying batteries to the separating station, saw means at the separating station serving to cut each battery arriving thereat into two parts, a first part containing battery terminals and the second part containing the battery plates, and locating means at the separating station for locating each battery arriving at the separating station at a predetermined position in relation to the saw means prior to cutting.

2. An apparatus according to claim 1 including a conveyor for conveying batteries from a feed station to the separating station and the second part from the separating station to a dispatch station.

3. An apparatus according to Claim 2 wherein the locating means includes a guide plate which protrudes above the plane of the conveyor and which extends in a direction parallel to the conveyor, a first locating bar extending longitudinally of the conveyor and mounted on the conveyor frame so as to be movable in a plane parallel to the conveyor surface towards and away from the guide plate and a second locating bar extending longitudinally of the conveyor and mounted on the conveyor frame so as to be movable toward and away from the conveyor the

which imparts said shock to the second part.

8. An apparatus according to claim 9 wherein the platform is movable from an upper position to a lower position to engage said stop.

9. An apparatus according to claim 7 or 8 wherein the stop is constructed at least in part from a resilient material such as rubber.

10. An apparatus according to any preceding claim including means from removing the terminals and other metallic parts from the first part.

11. An apparatus according to claim 10 wherein the means for removing the terminals and other metallic parts from the first part includes crushing means for crushing the first part into fragments and weight classifying means which separate the fragments so as to isolate the terminals and other metallic parts.

12. An apparatus according to claim 1 wherein the crushing means comprises two counter-rotating side-by-side rollers each having a plurality of radially extending projections, the projections of one roller being so positioned as to extend into the interstices defined by the projections of the other roller.

13. An apparatus according to claim 11 or 12 wherein the weight classifying means comprises an inclined duct in to which the fragments are fed, a stream of air directed in an upward direction along the duct, the arrangement being such that the lighter material making up the fragments are carried by the air stream to an outlet and the heavier material falls down the duct against the air stream to a separate outlet.

14. An apparatus according to any preceding claim wherein the saw means is a

saw having a circular blade the plane of which extends in a direction parallel to the direction of movement of the conveyor.

15. An apparatus according to claim 14 wherein the blade is provided with a plurality of teeth each of which has a cutting edge lying in a radial plane and which extends in a parallel direction to the axis of rotation of the saw blade.

16. An apparatus according to claim 15 wherein the cutting edge associated each tooth is bevelled at each end.

17. An apparatus for the recovery of lead from lead/acid batteries substantially as described hereinbefore with reference to and as illustrated in the accompanying drawings.

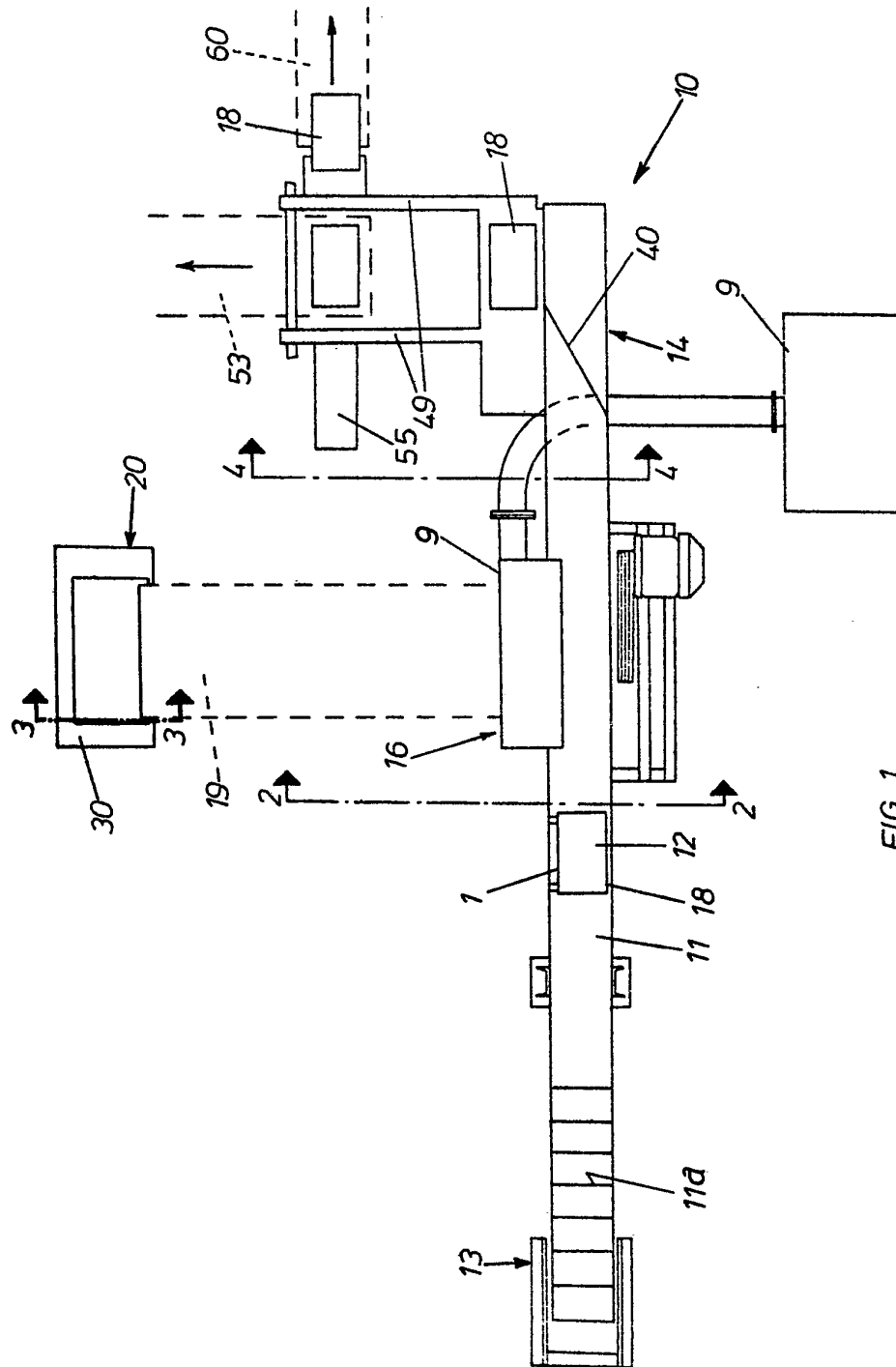
18. A method for the recovery of lead from lead/acid batteries including the step of feeding batteries to a separating station whereat each battery is cut into two parts, a first part containing the battery terminals and the second part containing the battery plates.

19. A method according to claim 18 wherein the first part is fed to a crushing means which crushes it in to fragments, the fragments then being classified to isolated the terminals and other metallic parts.

20. A method according to claim 18 or 19 wherein the second part is fed to a station whereat a physical shock is imparted to the second part to dislodge the plates therefrom.

21. A method for the recovery of lead from lead/acid batteries substantially as described hereinbefore with reference to the accompanying drawings.

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Chartered Patent Agents.
Nottingham and London.



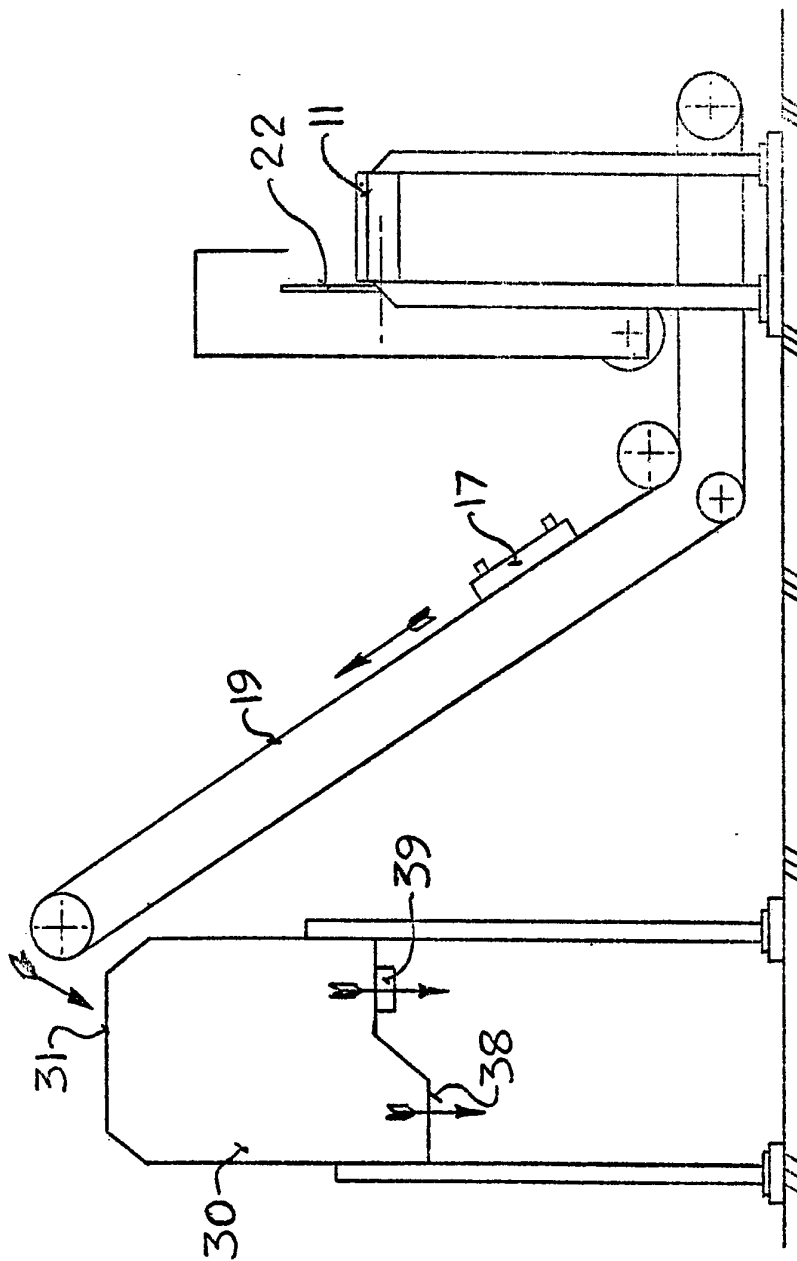
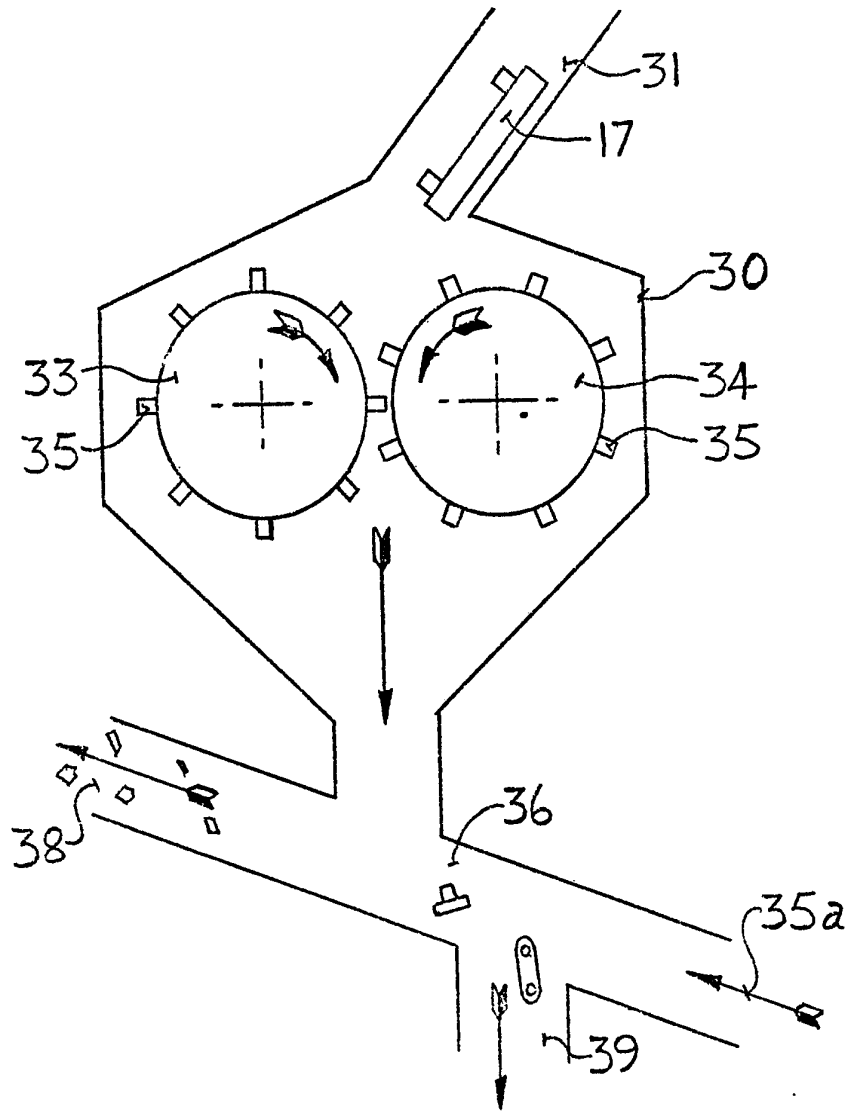
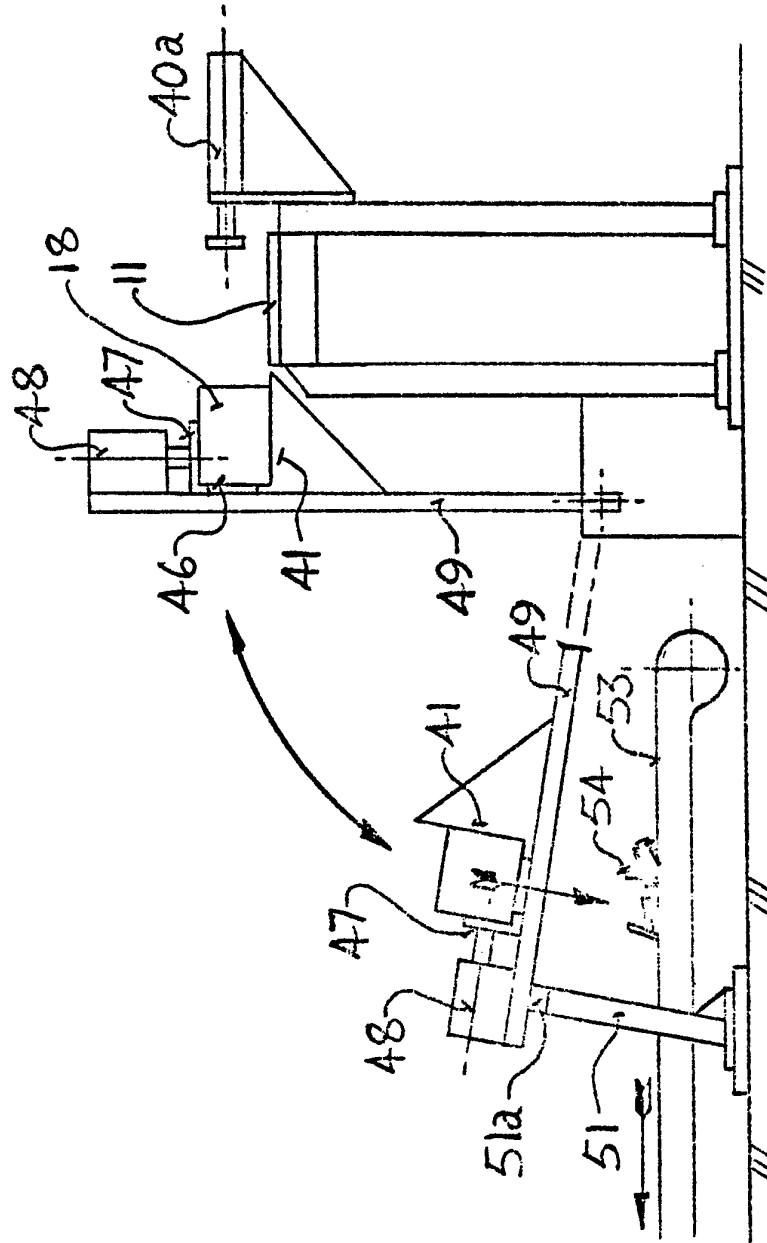
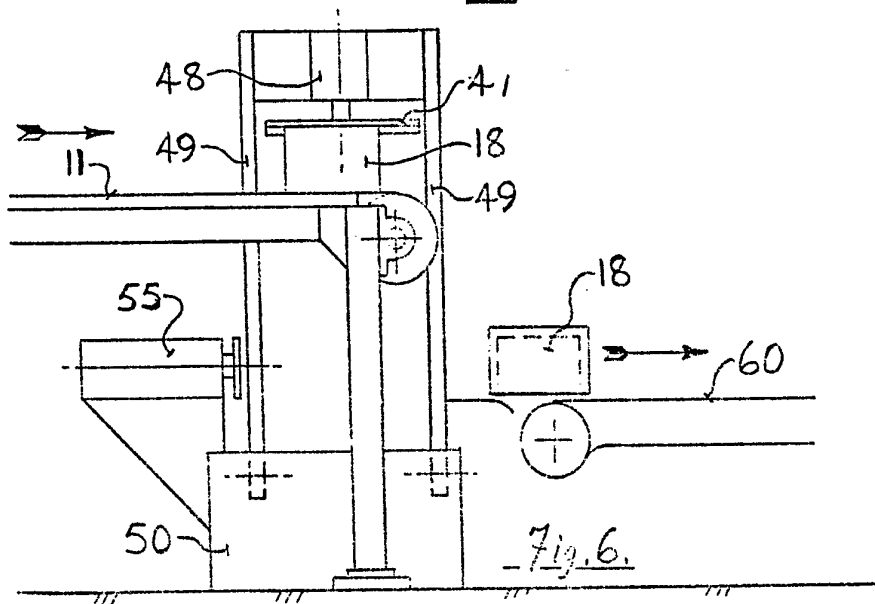
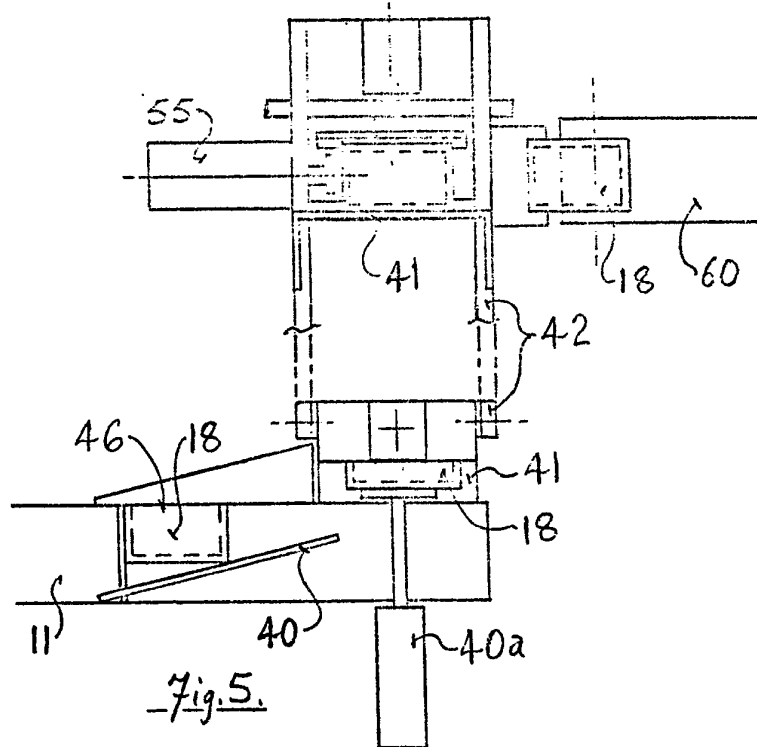


Fig. 2.







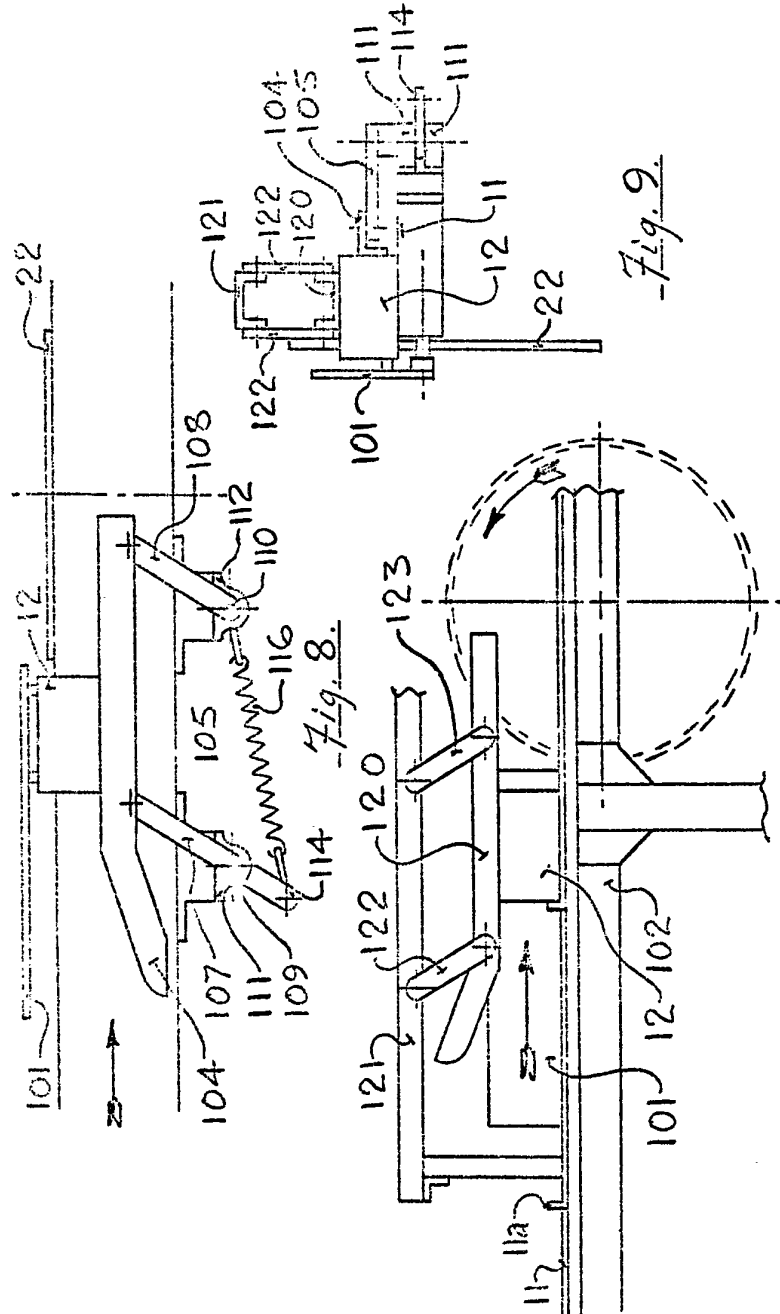


Fig. 9.

Fig. 7.

Fig. 8.

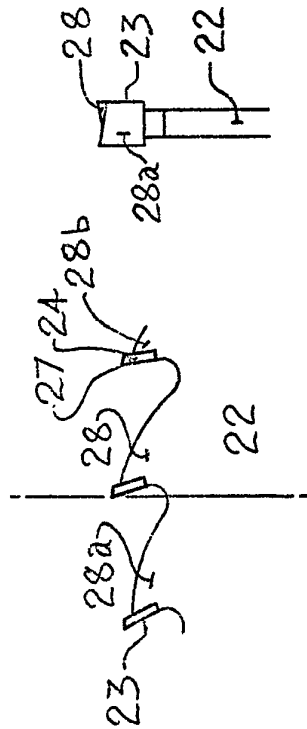


Fig. 10a

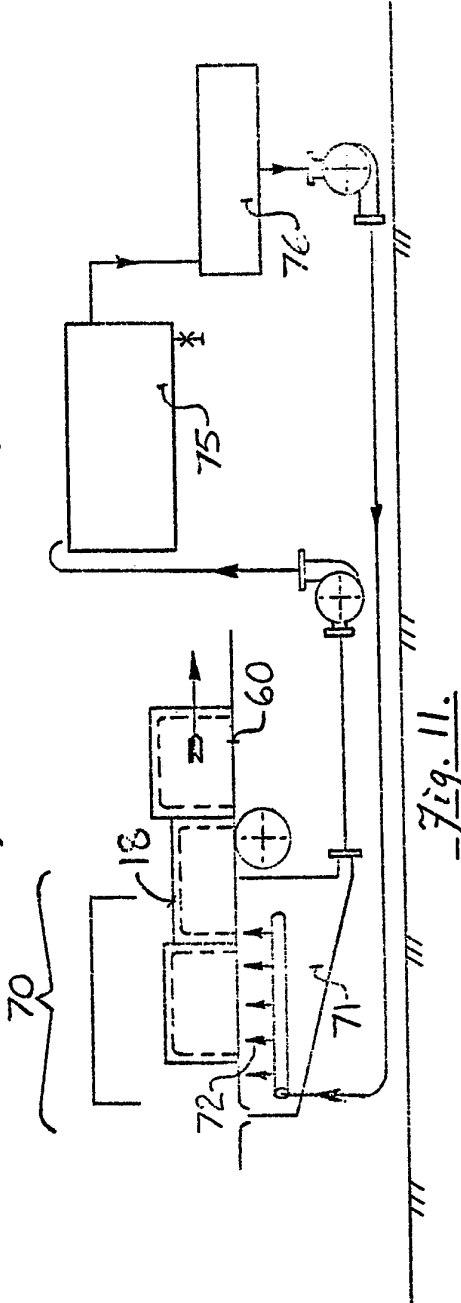


Fig. 10b

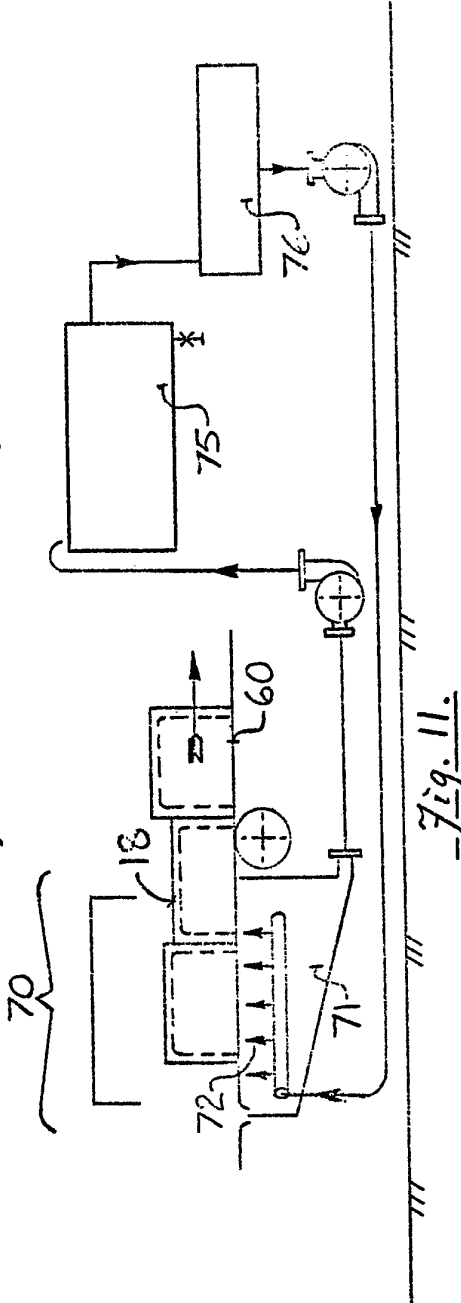


Fig. 11

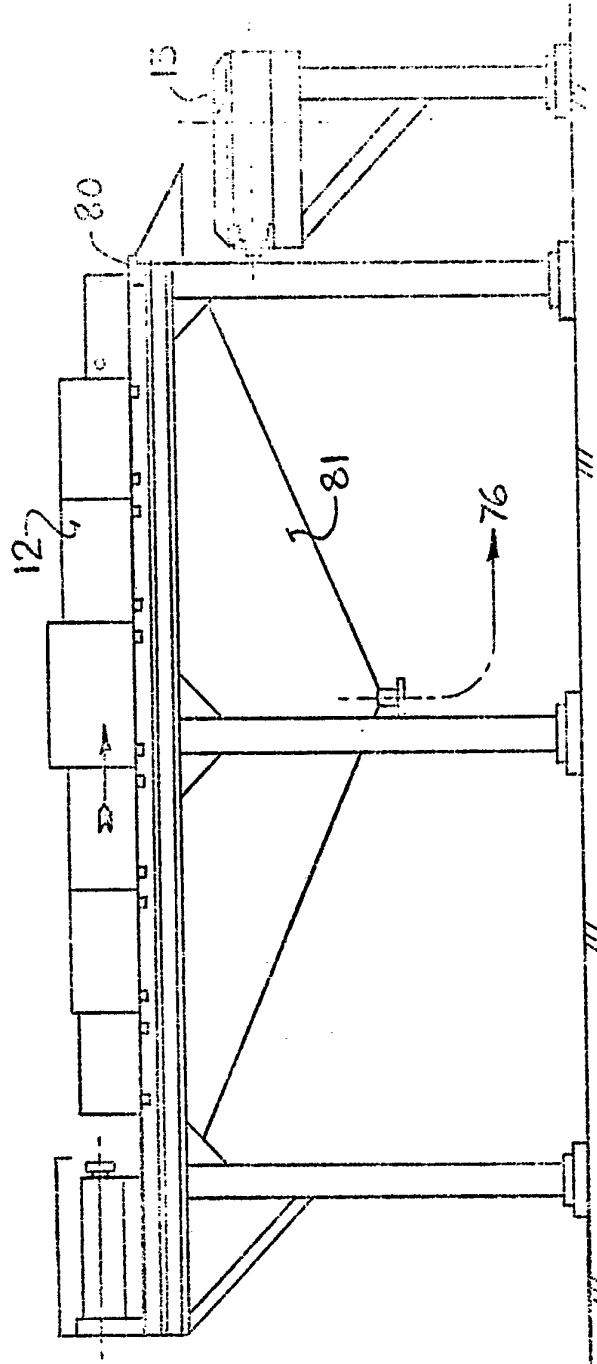


Fig. 12.