(12) UK Patent Application (19) GB (11) 2 135 979 A

(43) Application published 12 Sep 1984

(21) Application No 8404824

(22) Date of filing 24 Feb 1984

(30) Priority data
(31) 3306575 (32) 25 Feb 1983 (33) DE

(71) Applicant
Winkler & Dunnebier Maschinenfabrik Und Eisengiesserei GmbH & Co KG (FR Germany), Postfach 2340, D-5450 Neuwied 1, Federal Republic of Germany

(72) Inventor
Martin Blumle

(74) Agent and/or Address for Service
Kilburn & Strode, 30 John Street, London WC1N 2DD

(51) INT CL³
B65H 9/00

(52) Domestic classification
B8R 491 511 561 585 AD5
U1S 1789 B8R

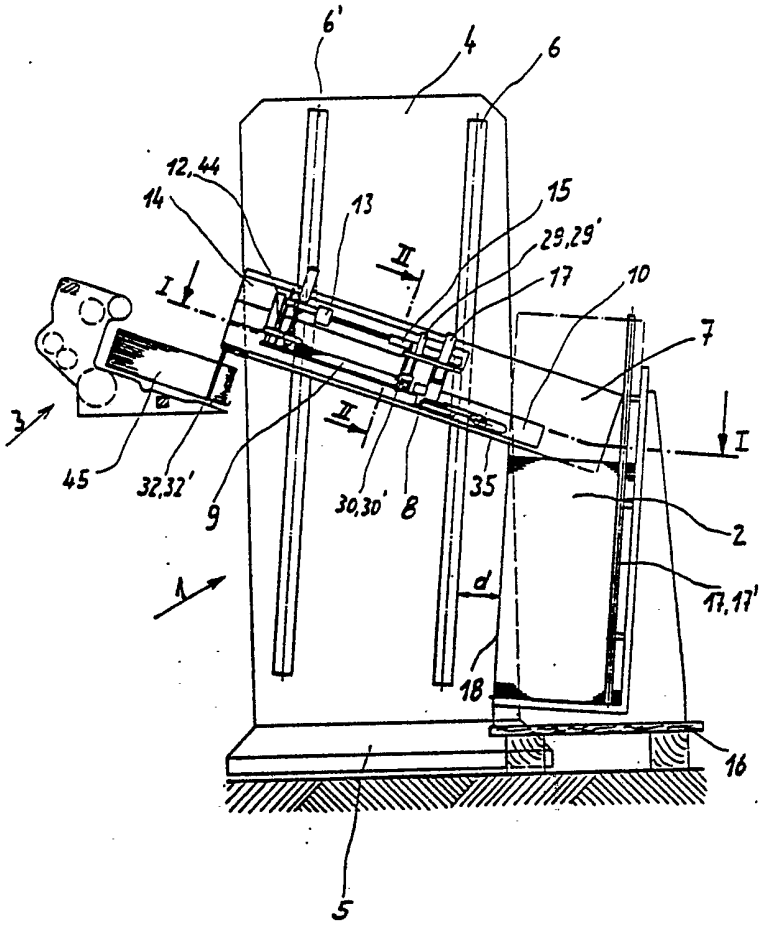
(56) Documents cited
GB 1578459 GB 1064302

(58) Field of search
B8R

(54) Sheet pile replenishing apparatus

(57) A pile replacement unit 1 e.g. in a bag or envelope making apparatus, transfers sub-piles of sheets 9 from a sheet pile 2 on the right to a sheet feeder 3 on the left by using a translatable table 8 having a separating roller 35 disposed in the plane of the table at an adjustable angle and which engages in the sub-pile in the top of the sheet pile 2. A clamp 12 can be lowered to engage and grip the forward edge of the sub-pile and draw it onto the table 8 whereafter the table 8 is shifted to above the sheets 45 already on the sheet feeder 3 and vibratory aligning pins 30 and 30′ are lowered and exactly aligned with the sub-pile 9, see Figs. 2, 4 (not shown). The clamp 12 is then released, whereupon the sub-pile 9 is deposited in the exact position required on the pile of sheets 45 on the sheet feeder 3. The table 8 comprises a comb-like structure, with teeth of adjustable spacing, and the pins 30, 30′ are passed between the teeth of the comb to align the sub-pile on the table.

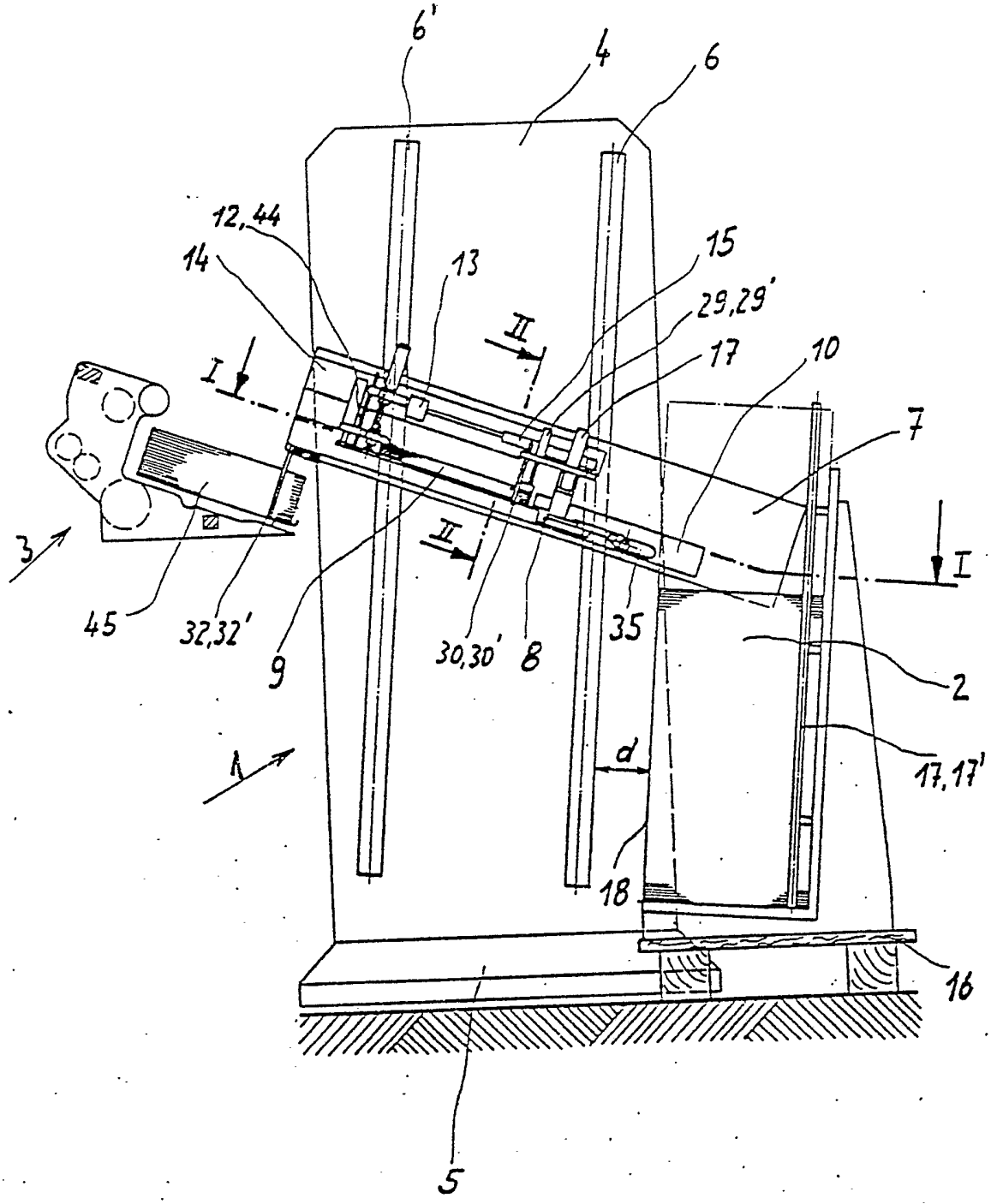
Fig. 1



GB 2 135 979 A

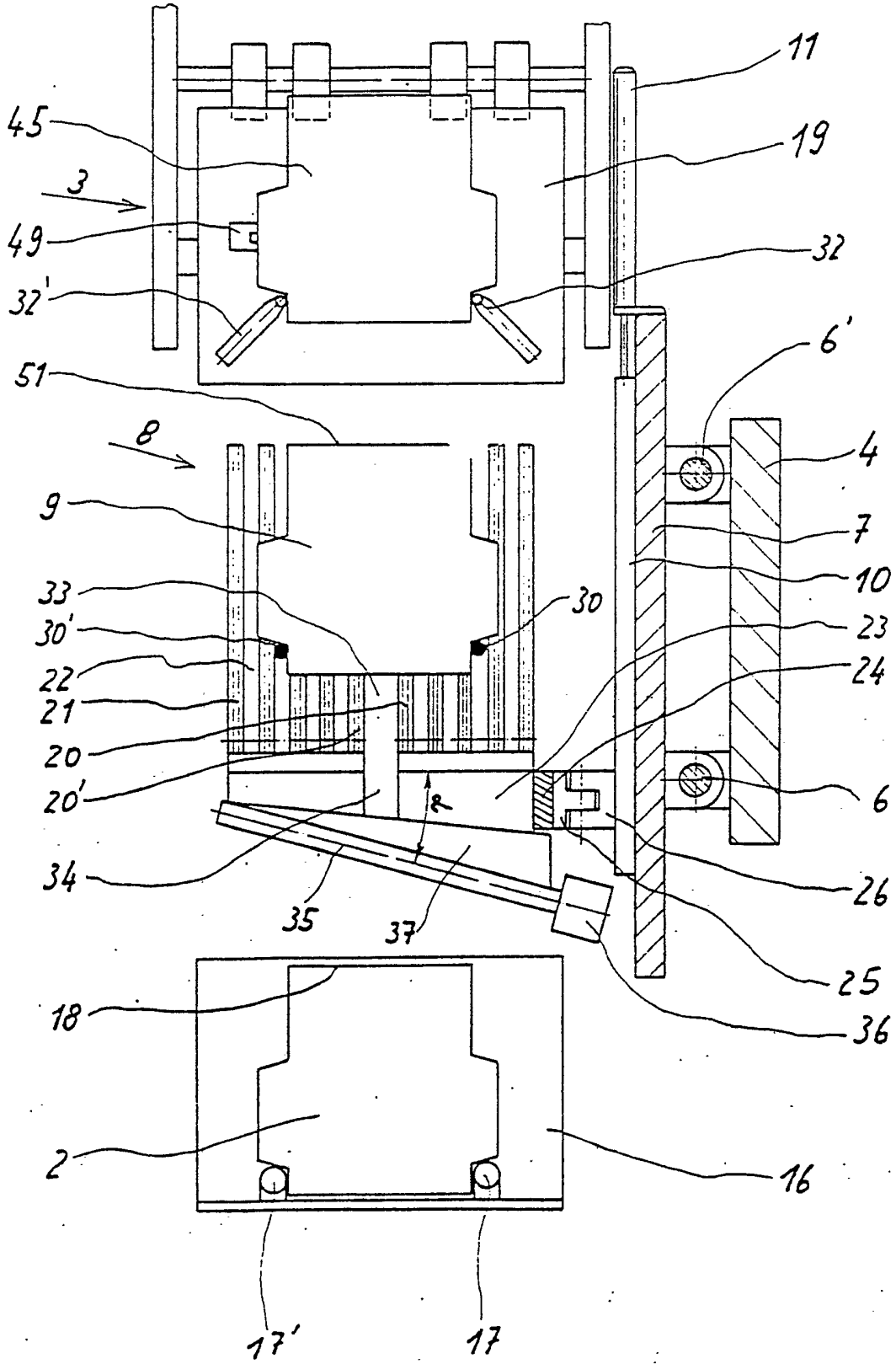
2135979

Fig. 1



2135979

Fig 2



2135979

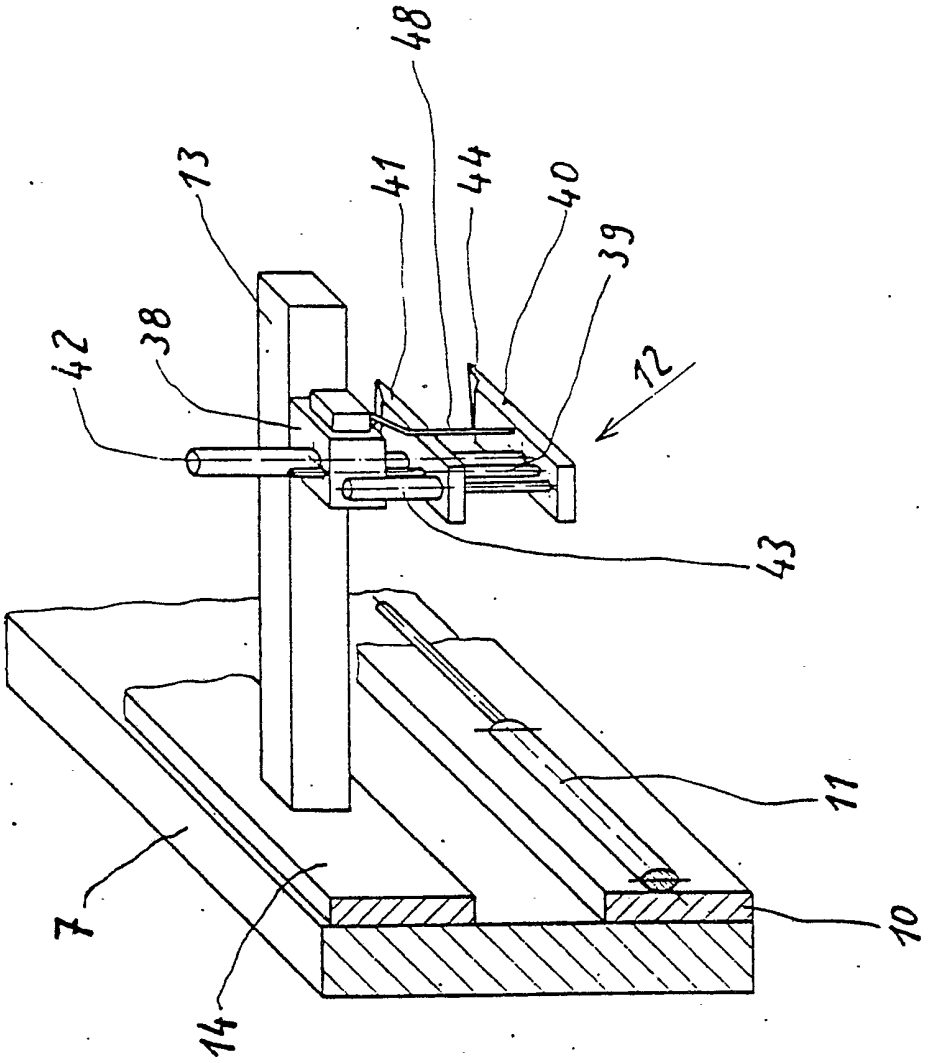


Fig.3

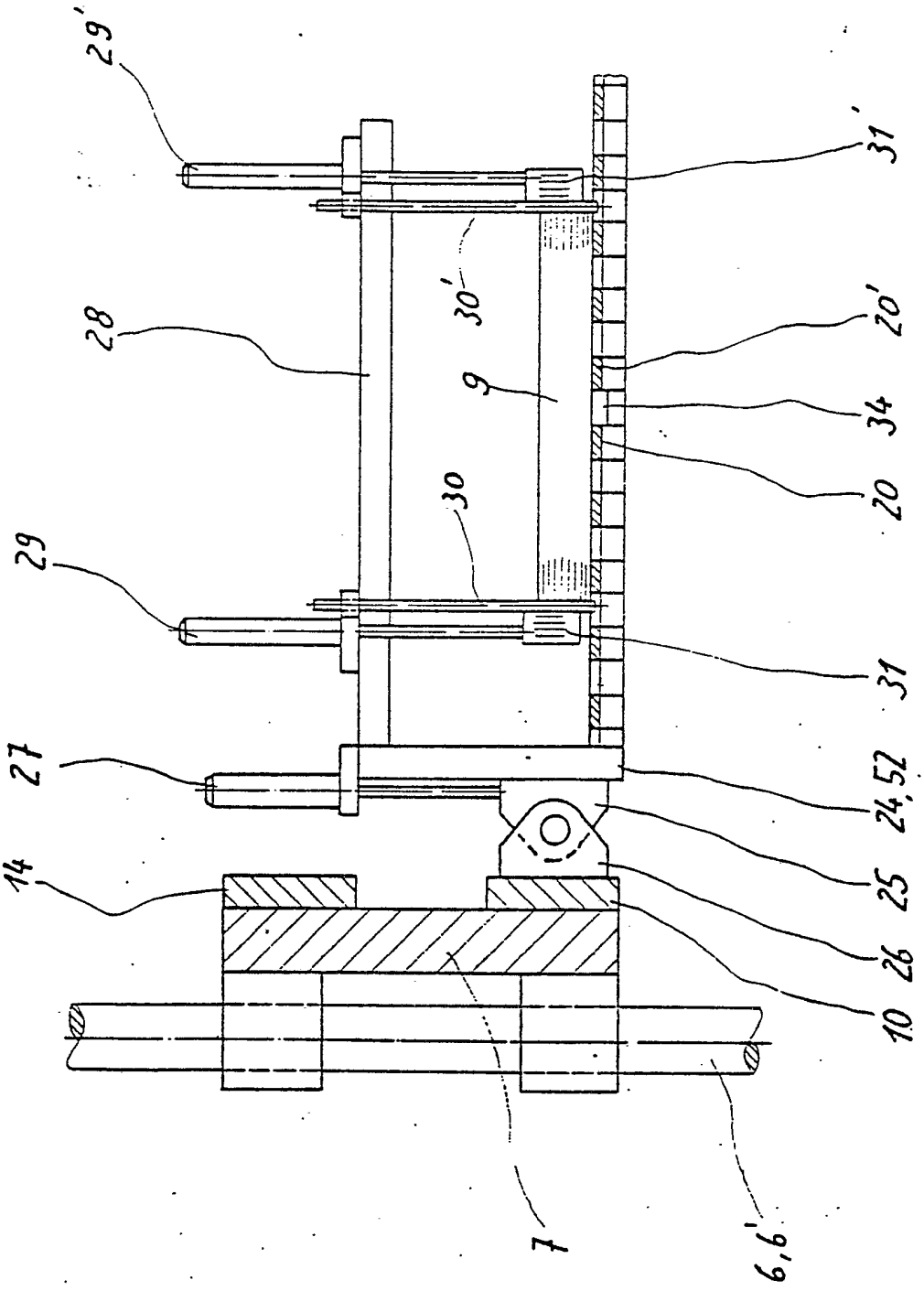
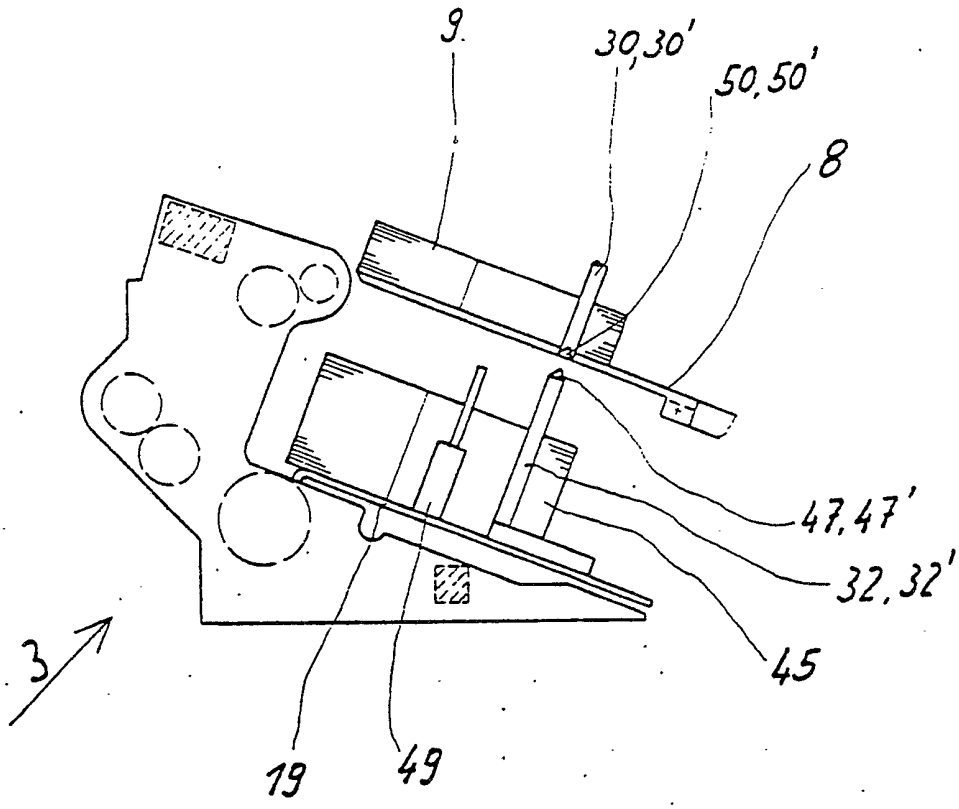


Fig 4

5/8

Fig 5



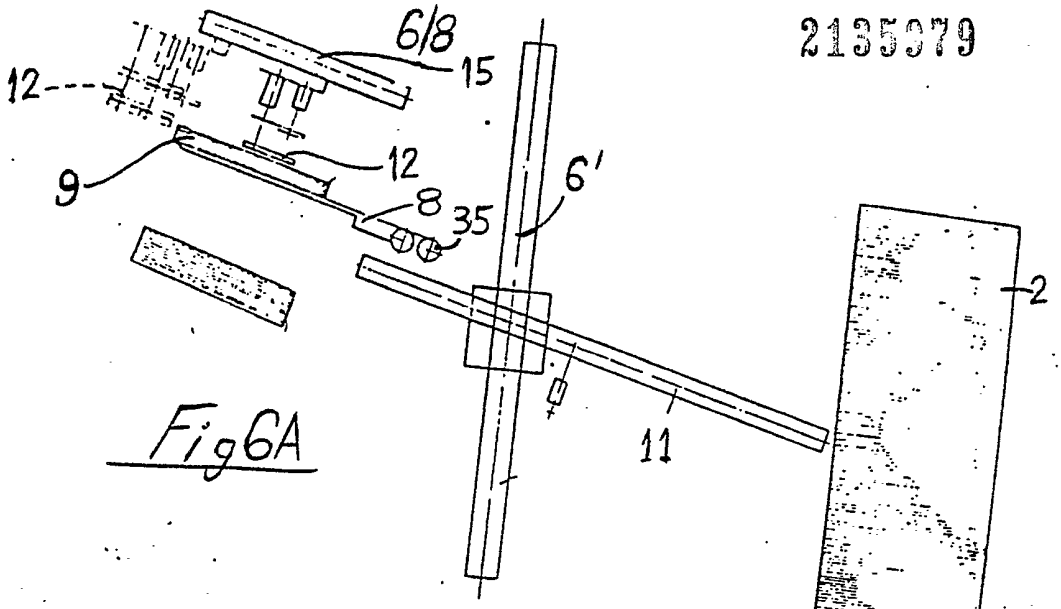


Fig6A

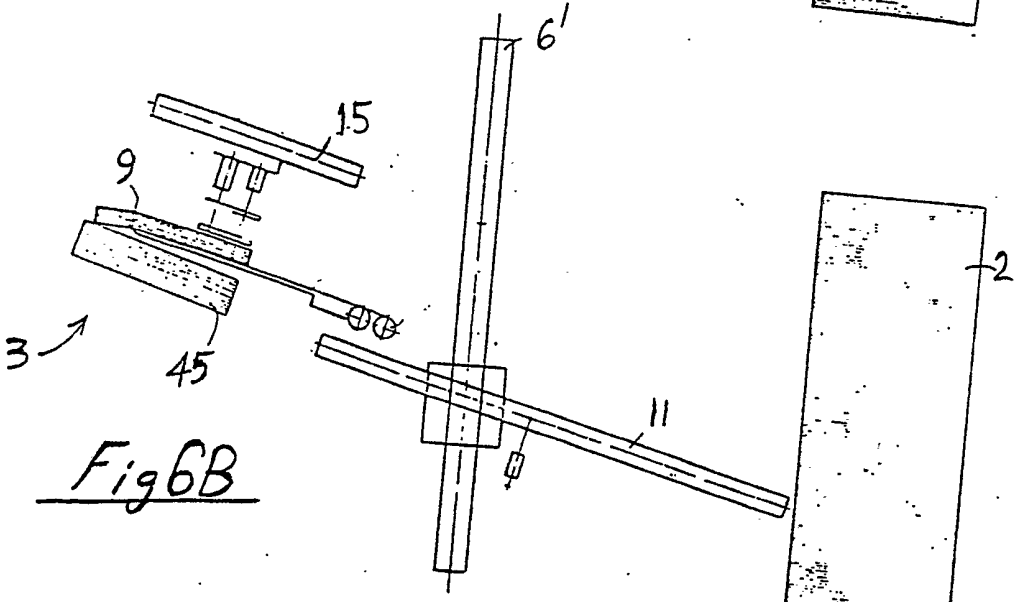


Fig6B

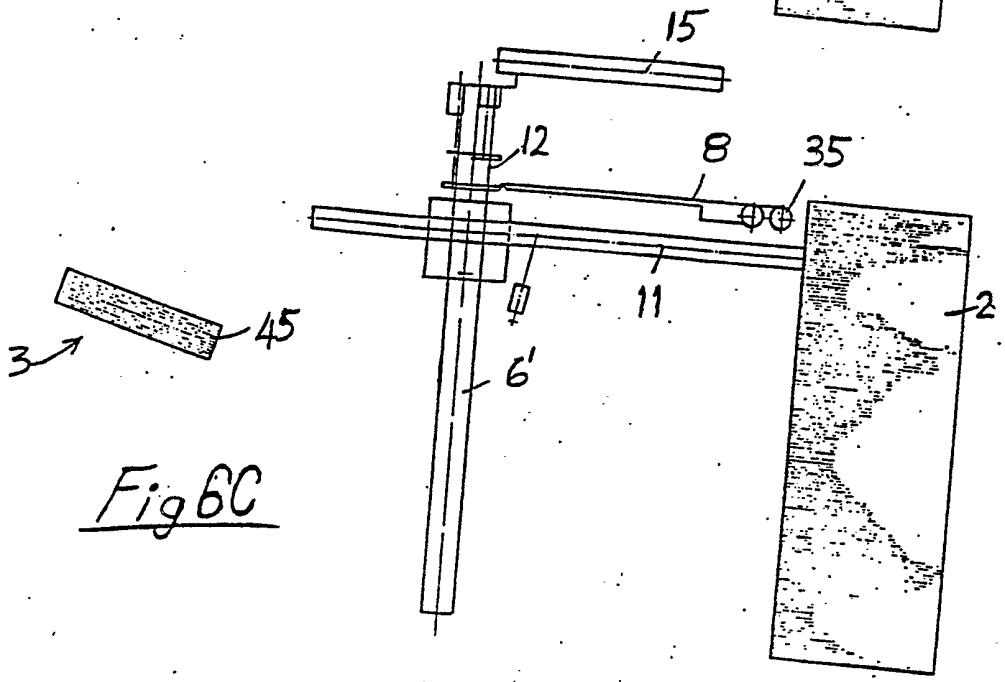


Fig6C

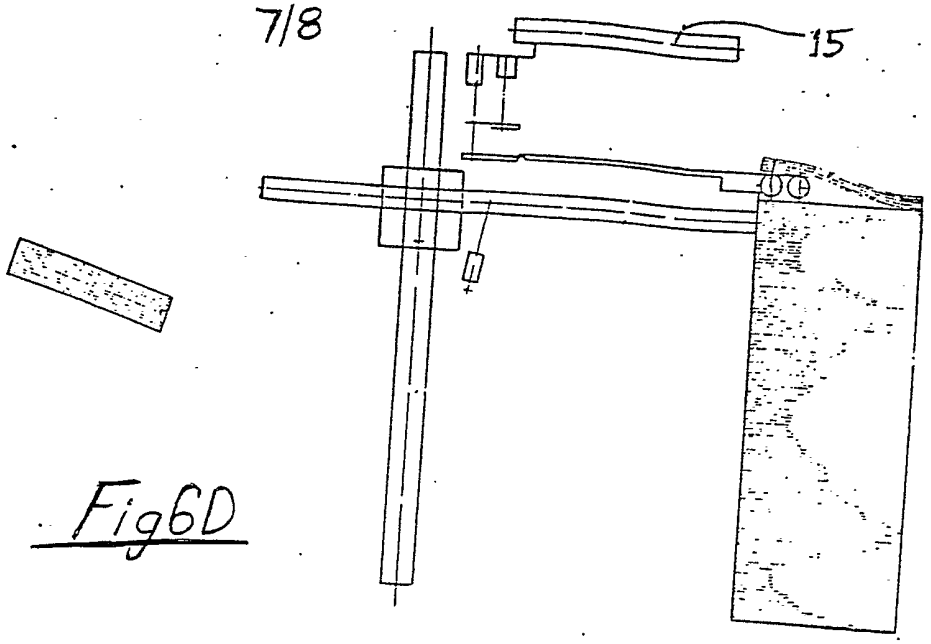


Fig6D

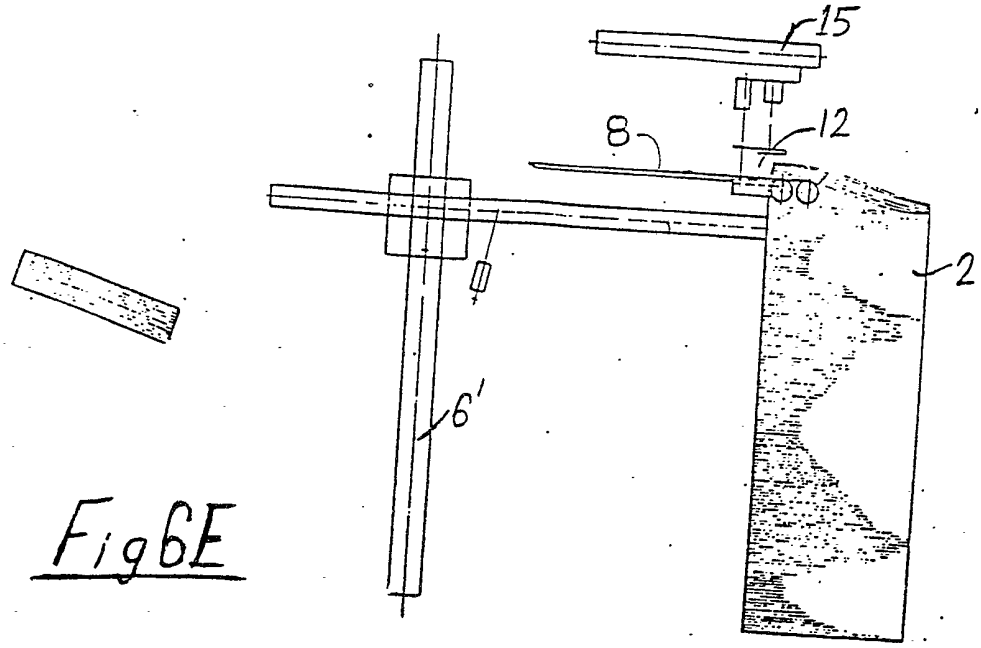


Fig6E

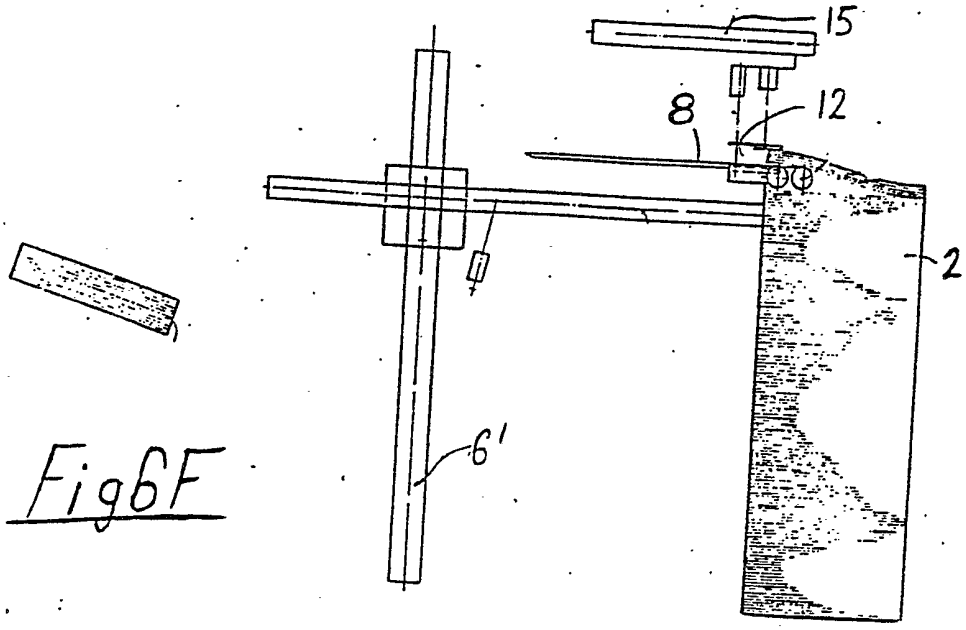


Fig6F

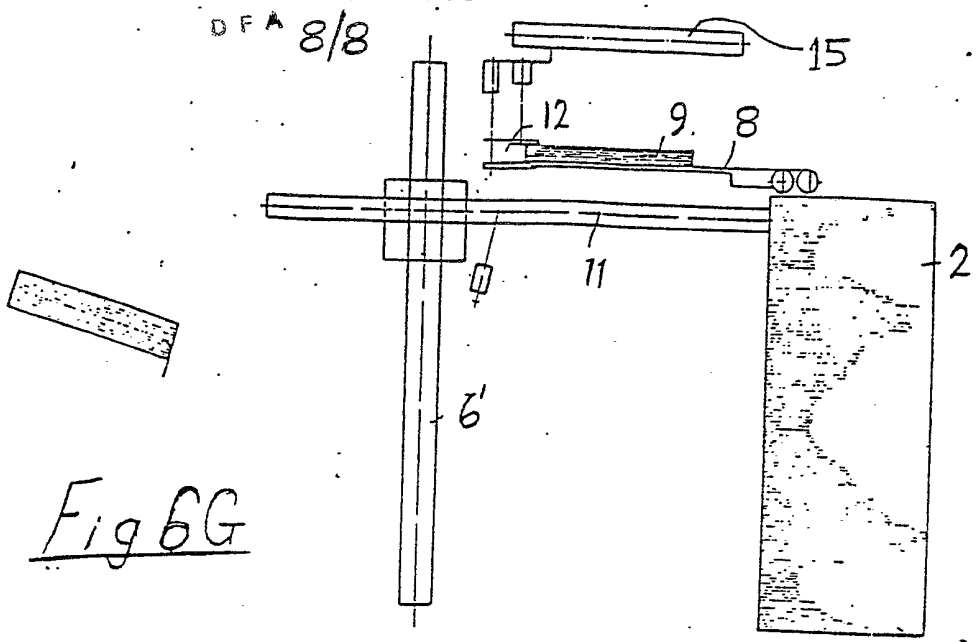


Fig 6G

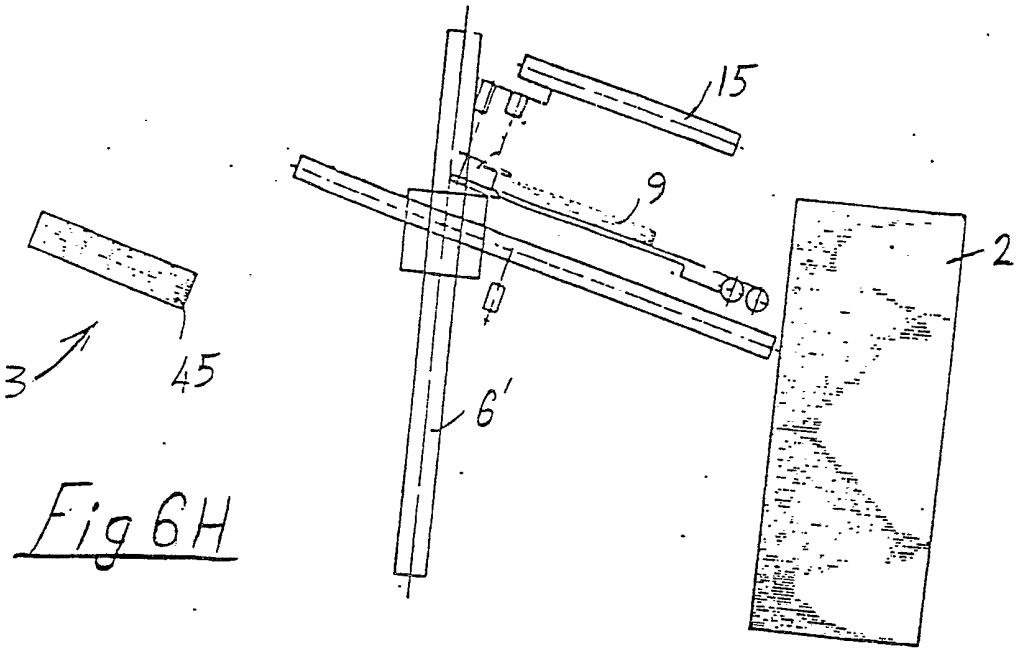


Fig 6H

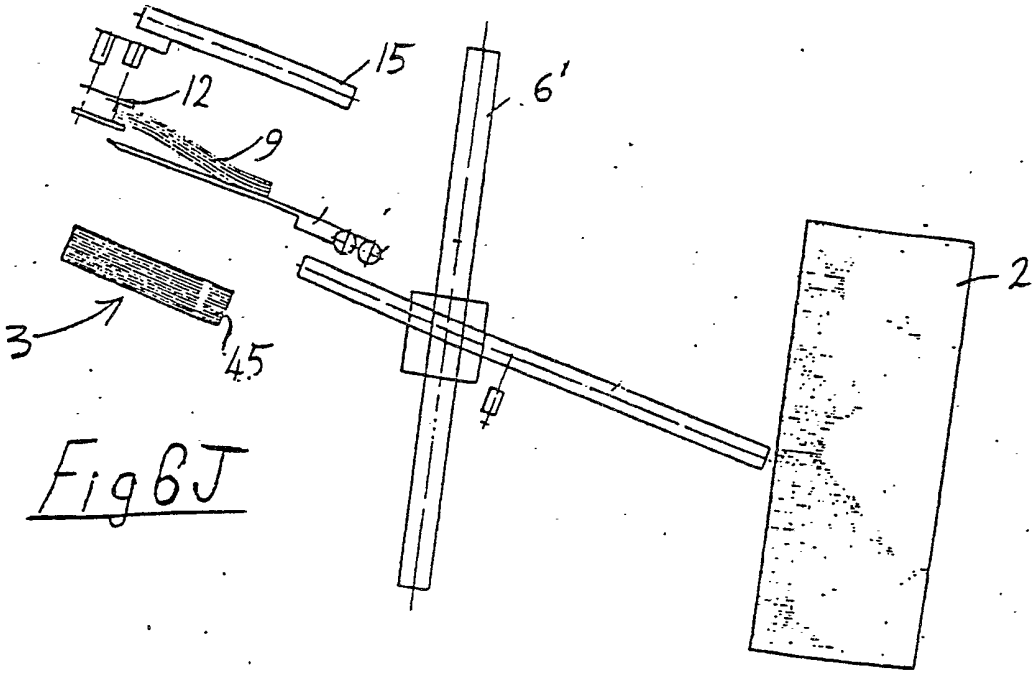


Fig 6J

SPECIFICATION

Sheet pile replenishing apparatus

This invention relates to apparatus for replenishing a pile of sheets for example in a bag or envelope manufacturing machine. For optimum operation of a sheet feeder of an envelope or bag making machine, the sheet pile on a pile plate of the sheet feeder must not exceed a given height. This means that the operatives using the machine frequently have to place sub-piles of sheets onto the pile plate. To eliminate this time-consuming and expensive human operation, pile replacement units are used, which supply sheets to the feeders from large sheet piles for example resting to pallets. To meet these requirements, it is known to use pile replacement or replenishment units operating with an inverted feeder which is fed from below. In this case, the large sheet pile is brought up to the feeder roller of the replacement unit from below and its operation is continued so that the topmost sheet of the pile always engages the roller. In this way, the sheets are engaged individually and conveyed onwards by means of rollers and then passed in a staggered arrangement to conveyor belts from which they are extracted and fed to the sheet feeder of the processing machine.

A distinct disadvantage of such a unit is that the feeder has to be fed from below and has to engage the sheets individually so that the rate of production of the processing machine is restricted to this speed of operation. Also, the conveying of the sheets in a staggered arrangement by belts followed by extraction of the sheets, means that the individual sheets are not accurately aligned and positioned when they reach the processing machine.

The object of this invention is to relieve the necessity for the operatives of the sheet-fed high-speed processing machines from the need continuously to replace the feed pile in order thus fully to utilise the production capacity of the machine.

To this end, the invention can be viewed in a number of aspects which for example include the employment of a sub-pile transfer system by which a sub-pile is transferred bodily from a stack to a pile requiring replenishment, for example on the production machine. Specifically, according to one aspect of the present invention, the apparatus includes a sub-pile transfer table arranged to carry a sub-pile of sheets from a stack to a pile requiring replenishment; The transfer table may be translatable both laterally and vertically.

According to another aspect of the present invention apparatus replenishing a pile of sheets, e.g. in a bag or envelope manufacturing machine, comprises a sub-pile transfer table arranged to carry a sub-pile of sheets from a stack to the pile to be replenished, the table including a number of spaced comb-like members between which sheet alignment means on the pile to be replenished, and/or the table, can extend.

At least certain of the comb-like members may be adjustable to vary the position of and/or the spacing between adjacent members. A sub-pile clamp may be included which is capable of drawing a sub-pile onto and/or off the table. The sub-pile clamp may include one jaw which can lie between a pair of the comb-like members. In this case the one jaw may have an edge which is arranged to fan the sheets of the sub-pile as the clamp is released therefrom.

According to another aspect of the present invention apparatus for replenishing a pile of sheets, e.g. in a bag or envelope manufacturing machine, comprises a sub-pile transfer table arranged to carry a sub-pile of sheets from a stack to the pile to be replenished, the table having adjacent one edge thereof a separating roller for engagement in the stack, the roller being set at an angle to the transverse extent of the sheets on the stack. The roller may preferably be set at an adjustable angle.

According to yet another aspect of the present invention, apparatus for replenishing a pile of sheets, e.g. in a bag or envelope manufacturing machine, comprises a sub-pile transfer table arranged to carry a sub-pile of sheets from a stack to the pile to be replenished, and including alignment means for aligning the sheets of the sub-pile on the transfer pile. The alignment means may be shiftable from an inoperative position at which time the sub-pile can be drawn onto the transfer table, and an operative position in which the alignment means can engage, and align, the sheets of the sub-pile. The alignment means may include or have associated therewith vibratory means for vibrating the alignment means.

The alignment means may specifically comprise a pair of upright pins which can be shifted in three mutually perpendicular direction, and the pins in their operative position may preferably extend between adjustable comb-like members of the transfer table. Other features according to the invention are the fact that the sub-pile is separated from the sheet pile and conveyed without any inaccuracy during transfer by virtue of the fact that the pile replacement unit operates with just one table. In addition the aligning means comprising the pins, together with the vibratory drive of the pins, accurately align the constituent sheets of the sub-pile. Also centring means may be provided between the aligning pins and pile-holders of the feeder pile plate to allow accurate positioning during transfer to the feeder sheet pile. A further

feature is that the sub-pile clamp may be used as a leafing or fanning means to break the bond between the sub-pile sheets. A further feature is a control means which so controls the unit delivery that the feeder sheet pile is always at an optimum working height.

The invention may be carried into practice in a number of ways, but one specific embodiment will now be described by way of example, with reference to the accompanying diagrammatic drawings in which:

Figure 1 is a side elevation of a pile replacement unit for an envelope or bag manufacturing machine;

Figure 2 is a sectional plan on the line I–I in Fig. 1;

Figure 3 is a perspective view of a sub-pile clamping device;

Figure 4 is a sectional side elevation on the line II–II of Fig. 1;

Figure 5 shows the sheet feeder of Fig. 1 on a larger scale, at the stage when it is being supplied with a fresh sub-pile, and

Figures 6A to 6H illustrate certain parts of the pile replacement unit at different stages of operation.

Referring generally to Figs. 1 and 2, the pile replacement unit comprises a central pile feeder 1 having positioned, to the left, a sheet feeder 3 to which sub-piles 9 of sheets are supplied by the pile feeder 1 from a sheet pile 2 on the right of Fig. 1. In general this is achieved by various parts of the pile feeder, including a table 8 which can be translated in a generally horizontal manner between the sheet pile 2 and the sheet feeder 1, and also raised and lowered when appropriate. The table 8 also co-operates with a sub-pile clamp 12, the detail of which is shown in perspective in Fig. 3 and which serves to grip a sub-pile during certain stages of operation.

As shown in Figs. 1 and 2, the central pile feeder 1 comprises an upright 4, having a base plate 5 for mounting on a floor. The upright carries a pair of parallel guides 6 and 6′ which, as shown in Fig. 1, are slightly inclined to the vertical. The guides 6 and 6′ have mounted thereon a carriage 7 which can be moved up and down the guides 6 and 6′ by hydraulic drive means (not shown).

The table 8, which has previously been referred to, and which serves to convey the sub-pile 9 from the sheet pile 2 to the sheet feeder 3, is mounted for movement in a translational and generally horizontal sense, on the carriage 7, by means of a guide 10, shown in Figs. 2, 3 and 4. Thus the table 8 includes a transverse support 23 (see Fig. 2) which extends horizontally away from an upright member 24, shown in section in Fig. 2 and in elevation in Fig. 4, the connection between the upright member 24 and the guide 10 comprising an articulated joint formed by two parts 25 and 26 carried respectively by the upright member 24 and the guide 10. Figs. 2 and 3 show a drive cylinder 11 which extends between the carriage 7 and the guide 10 and which serves to drive the table 8 from left to right and vice versa in Fig. 2.

As can be seen from Figs. 2 and 4, the table 8 is generally in the form of a comb, formed by a number of comb teeth 21, the left-hand ends of which in Fig. 2 have free ends facing the sheet feeder 3. The comb teeth are adjustable with respect to one another in order to vary the gaps 22 between the teeth, except for the spacing between the two fixed central teeth 20 and 20′ which have a fixed gap 33 maintained between them.

To the right of the comb teeth in Fig. 2, the gap 33 is co-extensive with a groove 34 formed in the transverse support 23. This groove 34 can also be seen in Fig. 4.

To the right of the transverse support 23 in Fig. 2 the table 8 carries a separating roller 35 having a drive mechanism 36. The separating roller is usually arranged in an inclined manner with respect to the direction of movement of the table, as shown in Fig. 2, and its angle of attack α for introduction into the sheet pile 2 can be varied. A segment plate 37 is positioned between the roller 35 and the transverse support 23, and partly rests on the support 23 so that there is no gap between the table 8 and the roller 35 in any of its adjusted positions.

The articulated joint formed by the parts 25 and 26 permits the table to be pivoted upwards when required. In addition, the upright member 24, which carries table 8, is mounted for vertical movement with respect to the part 25 of the articulated joint by means of a further drive cylinder 27 (see Fig. 4) secured to the upright member 24 and having its piston connected to the part 25 of the articulated joint. These parts serve to raise and lower the table during its transfer operations.

As shown in Fig. 4, a transverse support member 28 extends laterally from the upper end of the upright member 24 and parallel to the table 8, the member 28 carrying a pair of parallel, generally vertically arranged, drive cylinders 29 and 29′, the pistons of which, at their lower ends, carry alignment pins 30 and 30′, respectively, and vibratory drives 31 and 31′, which together serve to engage and align the sheets of the sub-pile 9 in the position shown in Fig. 2. When in their lowered position the pins 30 and 30′ pass between combs of the table. The pins can be laterally adjusted along the member 28, and the spacing of the combs correspondingly adjusted. The pins 30 and 30′ are raised clear of the path of the sub-pile 9 on the table 8 as the sub-pile is picked up from the sheet pile 2, but thereafter the pins 30 and 30′ are lowered and vibrated to ensure correct stacking alignment of the constituent sheets of the sub-pile 9.

As has been mentioned in the introduction to this description, Fig. 3 illustrates a sub-pile clamp 12 which is supported by a block 38 carried by a horizontal clamp holder 13 cantilevered out from a guide 14, which in turn is supported on the carriage 7. The guide 14 can be moved laterally with respect to the carriage by means of a hydraulic cylinder 15 shown in Fig. 1 and in Figs. 6A, 6B etc.

As shown in Fig. 3, the block 38 of the cantilevered clamp holder 13 receives a reciprocable guide rod 39 which has generally vertical movement, the rod 39 carrying at its lower clamp jaw 40 having a tapered forward edge 44 for leafing through the sheets. The width of the lower clamping jaw 40 is such that it can lie within the central gap 33 in the table 8, and also, when required, within the groove 34 in the transverse support 23 for the table 8. The lower clamp jaw 40 is arranged to be raised and lowered with respect to the block 38 by means of a hydraulic cylinder 42. An upper clamp jaw 41 is guided for vertical movement on the guide rod 39, and also on the piston rod of the hydraulic cylinder 42. The upper clamp jaw 41 is arranged to be raised and lowered with respect to the lower jaw 40 by means of a further hydraulic cylinder 43. A sensor 48 is secured to the block 38 in order to sense the front edge 51 (see Fig. 2) of the separated sub-pile 9.

The sheet pile 2 is supported on a pallet 16 on the right in Fig. 1, the pallet also supporting a pair of generally upright spaced pile holders 17 and 17', which, as shown in Fig. 2, engage the sheets of the pile 2 in generally the same position as the alignment pins 30 and 30' eventually engage the sub-pile 9 on the table 8.

Fig. 5 illustrates the sub-pile 9, aligned by the aligning pins 30 and 30', and resting on the upper side of the combs of the table 8, just before the sub-pile 9 is positioned on the pile of sheets 48 already on the sheet feeder 3, the latter pile 48 being held in the correct position by pile holders 32 and 32'. It will be seen from Fig. 5 that the upper ends of the pile holders 32 and 32' are tapered and these are arranged to enter corresponding tapered recesses in the lower ends of the aligning pins 30 and 30' in order to provide accurate centring of the sub-pile 9 over the sheet feeder 3. The sheet feeder 3 carrries a sensor 49 which is adjustably secured to a plate 19 of the sheet feeder and senses the height of the pile 48 when a replenishing cycle has to be initiated.

A complete working cycle of the pile replacement unit will now be described with particular reference to the series of diagrammatic drawings shown in Fig. 6.

It will be assumed that the starting position is in Fig. 6A with the table 8 situated above the pile 45, the clamp 12, having released the sub-pile 9, and now being positioned above the sub-pile as shown in Fig. 6A. At this time the aligning pins 30 and 30' (not shown in Fig. 6A) are lowered and are engaging the sub-pile 9 in the position shown in Fig. 2 and in Fig. 5 directly above the pile holders Figs. 32 and 32'. The table 8 descends as shown in Fig. 6B under the operation of the drive cylinder 27 (Fig. 4), the aligning pins 30 and 30' engaging the upper ends of the pile holders 32 and 32' and stopping, while the vibratory drives 31 and 31' are simultaneously switched off.

The aligning pins 30 and 30' are then raised by the drive cylinders 29 and 29' (Fig. 4) to their top position away from the sub-pile. This allows the table 8 to be lowered to the position of Fig. 6B and then withdrawn away from the sheet feeder pile 45, so that the sub-pile is deposited in exact alignment on the pile 45. At this time the pile holders 32 will extend upwardly through the adjustable combs of the table 8. The drive cylinder 27 (Fig. 4) then raises the table 8 with respect to the part 25 of the articulated joint and moves it to the right on the guide 10, under the operation of the cylinder 15, into a position shown in Fig. 6C between the pile 2 and the sheet feeder 3, and at a correct height with respect to the sheet pile 2 to withdraw the correct thickness of sub-pile 9. As shown in Fig. 6D this operation is carried out by the carriage 7 being moved up the guides 6 and 6' by the hydraulic drive means (not shown). The clamp 12 is then moved laterally by the cylinder 15, its lower jaw 40 passing through the central table gap 33, and the groove 34. At this time the lower jaw 50 has passed into the groove 34 in the transverse support 23 of the table 8 immediately behind the segment plate 37 of the separating roller 35.

The separating roller 35 then starts to rotate and, by further gradual operation of the cylinder 15, the separating roller 35 and the table 8 move with respect to the guide 10 so that the roller 35 engages in the sheet pile 2 shown in Fig. 6E and at the same time are raised slightly with respect to the guides 6 and 6'. Thereafter the separating roller 35 stops and the clamp 12 is lowered to the position of Fig. 6F to grip the sub-pile 9. If desired, the table 8 may be moved further to the right in Fig. 6E, for example until the separating roller 35 is just in front of the pile holders (17 and 17') and may be lifted slightly to separate the sub-pile. The clamp 12 is then moved back to the position of Fig. 6G and thereby draws the sub-pile 9 leftwards until its front edge 51 (Fig. 2) is flush with the edge of the table 8, facing the sheet feeder 3. Thereafter, the table 8 is tilted between the position of Fig. 6G and the position of Fig. 6H in order to position the sub-pile 9 parallel to the top of the pile 45 on the sheet feeder 3. The alignment pins 30

and 30' are now lowered into the rear corners of sub-pile 3 at which time the clamp 12 opens and the vibratory drive 31 and 31' are started. The clamp 12 is now withdrawn leftwards and upwards to release it from the sub-pile 9. As the tip 44 of the lower clamp jaw 40 is moved away and upwards it leafs through the sub-pile 9, so freeing the sheets 9 from one another.

The clamp 12 can then be shifted back to the position shown in Fig. 6A.

If the pile replacement unit 1 is not in use, for example when small quantities are being processed, the table 8 can be swung about the articulated joint formed by the parts 25 and 26 so that the sheet feeder 3 is more readily accessible to the machine operatives.

The angle α at which the separating roller 35 is set can be varied to suit the form of the sheets or envelope blanks on the sheet pile. In some cases the blanks will be rectangular and it may be appropriate for the roller to lie transversely of the table; in other instances e.g. with envelope blanks of the form shown in Fig. 2, it will be more efficient for the roller to be set at an angle, and the choice of angle can be determined by experimental trial; it will generally depend on the nature of the leading edge of the blank, and the thickness of the blank.

Whilst the apparatus shown in the exemplary embodiment utilises a variety of features, e.g. the adjustable comb-like table 8, the alignment pins 30 30', and the angled and adjustable separating roller 35, in certain circumstances some of these features may be omitted.

CLAIMS

1. Apparatus for replenishing a pile of sheets, e.g. in a bag or envelope manufacturing machine, comprising a sub-pile transfer table arranged to carry a sub-pile of sheets from a stack to the pile to be replenished, the table including a number of spaced comb-like members between which sheet alignment means on the pile to be replenished, and/or on the table, can extend.

2. Apparatus as claimed in Claim 1 in which at least certain of the comb-like members are adjustable to vary the position of and/or the spacing between adjacent members.

3. Apparatus as claimed in Claim 1 or Claim 2 including a sub-pile clamp capable of drawing a sub-pile onto and/or off the table.

4. Apparatus as claimed in Claim 3 in which the sub-pile clamp includes one jaw which can lie between a pair of the comb-like members.

5. Apparatus as claimed in Claim 4 in which the one jaw has an edge which is arranged to fan the sheets of the sub-pile as the clamp is released therefrom.

6. Apparatus for replenishing a pile of sheets, e.g. in a bag or envelope manufacturing machine, comprising a sub-pile transfer table arranged to carry a sub-pile of sheets from a stack to the pile to be replenished, the table having adjacent one edge thereof a separating roller for engagement in the stack, the roller being set at an angle to the transverse extent of the sheets on the stack.

7. Apparatus as claimed in Claim 6 in which the roller can be set at an adjustable angle.

8. Apparatus for replenishing a pile of sheets, e.g. in a bag or envelope manufacturing machine, comprising a sub-pile transfer table arranged to carry a sub-pile of sheets from a stack to the pile to be replenished, including alignment means for aligning the sheets of the sub-pile on the transfer table.

9. Apparatus as claimed in Claim 8 in which the alignment means is shiftable from an inoperative position at which time the sub-pile can be drawn on to the transfer table, and an operative position in which the alignment means can engage, and align, the sheets of the sub-pile.

10. Apparatus as claimed in Claim 9 in which the alignment means includes, or has associated therewith, vibratory means for vibrating the alignment means.

11. Apparatus as claimed in Claim 9 or Claim 10 in which the alignment means comprises a pair of upright pins which can be shifted in three mutually perpendicular directions.

12. Apparatus as claimed in Claim 11 in which the pins, in their operative position extend between adjustable comb-like members of the transfer table.

13. An envelope or bag making apparatus including a sub-pile transfer table arranged to carry a sub-pile of sheets from a stack to a pile requiring replenishment.

14. Apparatus as claimed in Claim 13 in which the transfer table is translatable both laterally and vertically.

15. Apparatus as claimed in Claim 13 or Claim 14 including a sub-pile clamp mounted for generally horizontal movement with respect to the table and arranged to draw a sub-pile onto and/or off the table.

16. Apparatus as claimed in Claim 15 in which the table has a longitudinal upwardly facing groove therein which is arranged to receive a lower jaw of the sub-pile clamp with an upper surface of the clamp substantially in the same plane as the upper side of the table.

17. Apparatus as claimed in Claim 15 or Claim 16 in which the sub-pile clamp can be raised clear of the table.

18. Apparatus as claimed in any one of Claims 15 to 17 in which the sub-pile clamp includes an upper jaw which can be raised and lowered with respect to the lower jaw.

19. Apparatus for replenishing a pile of sheets substantially as specifically described

herein with reference to the accompanying drawings.

Printed in the United Kingdom for
Her Majesty's Stationery Office, Dd 8818935, 1984, 4235.
Published at The Patent Office, 25 Southampton Buildings,
London, WC2A 1AY, from which copies may be obtained.