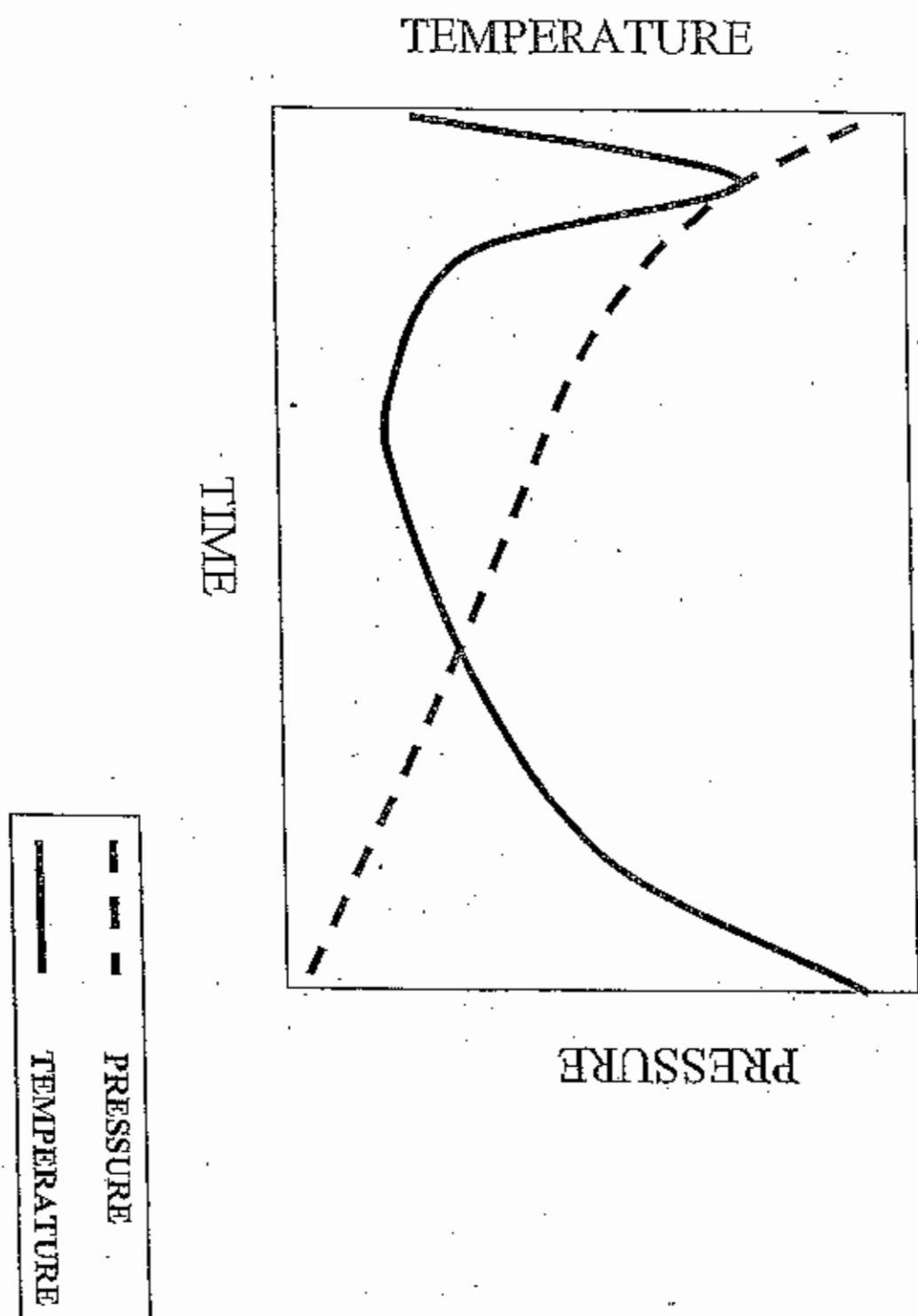


FIGURE 1: POLYESTER REACTION TEMPERATURE & PRESSURE PROFILES



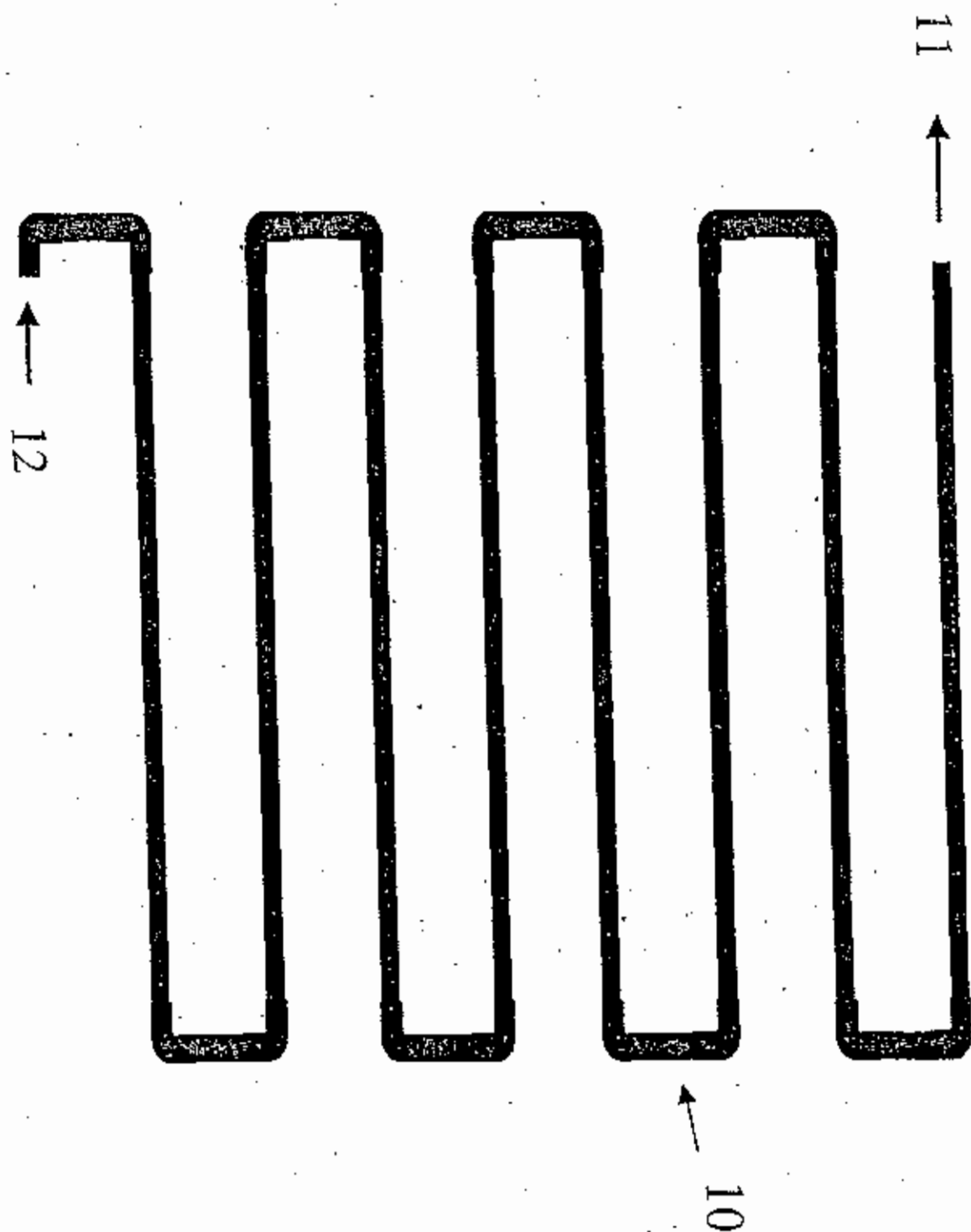


Figure 2: Esterification or Polycondensation Pipe Reactor

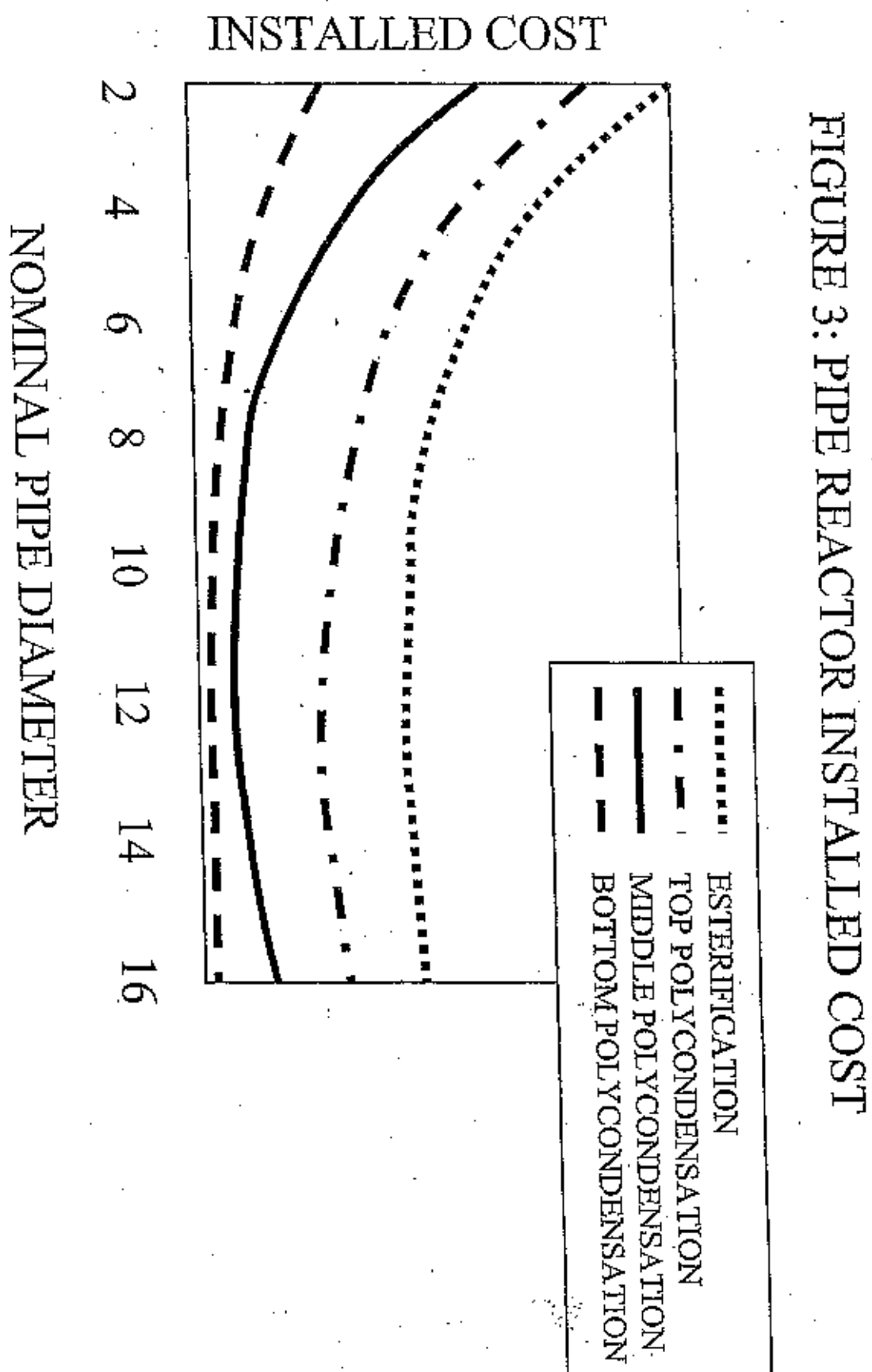
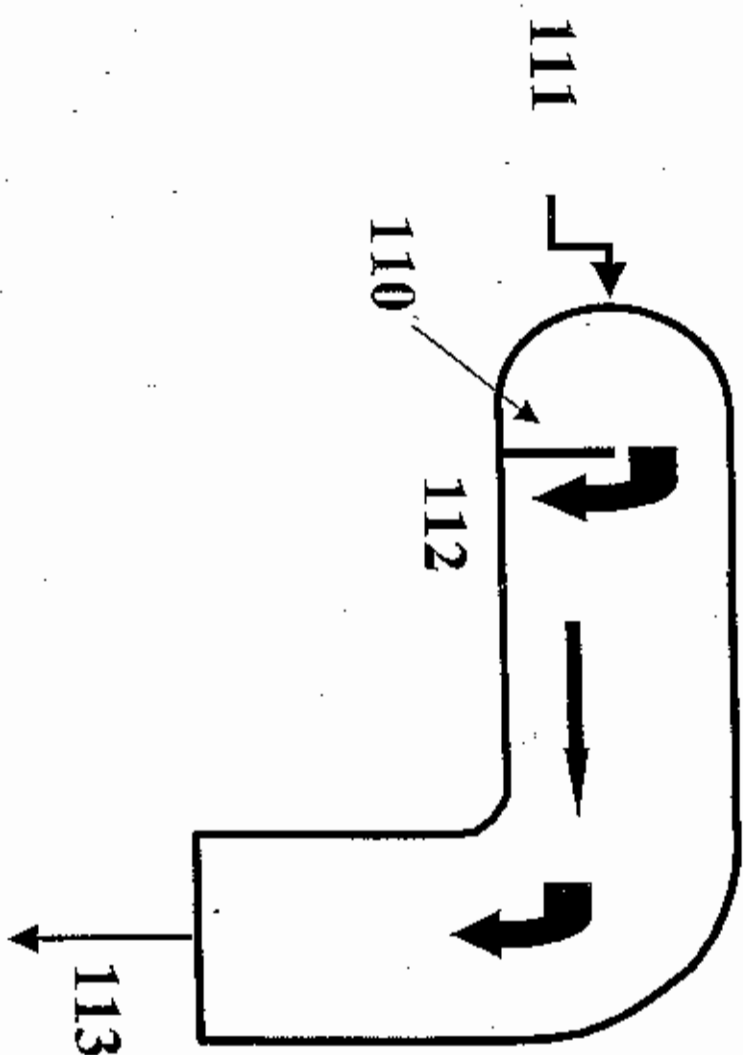


**Figure 4: Top of Ester Exchange or Esterification
Reactor where Level control occurs
Via a weir into the Polycondensation Reactor**



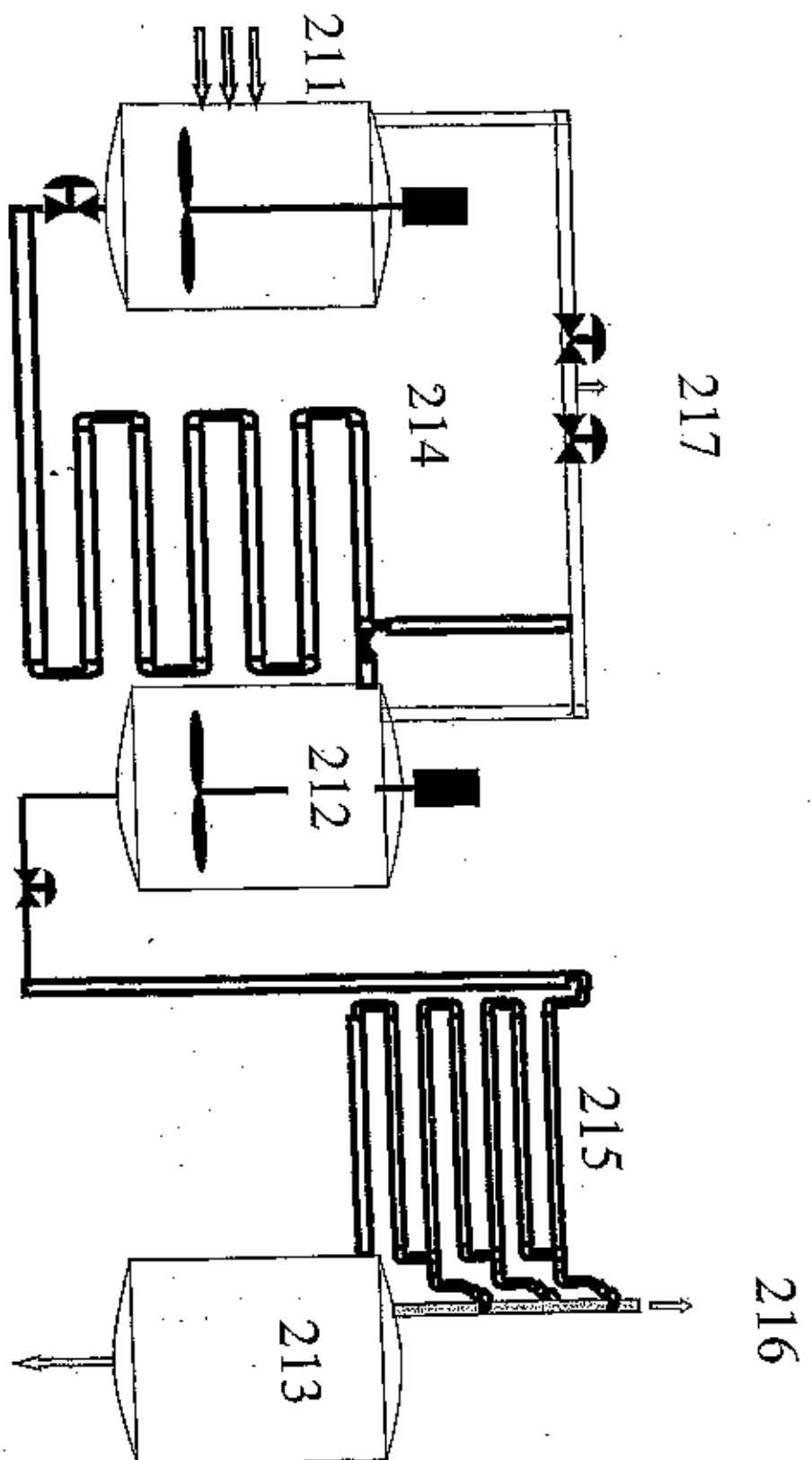


Figure 5: Modifying Existing Lines with Pipe Reactor

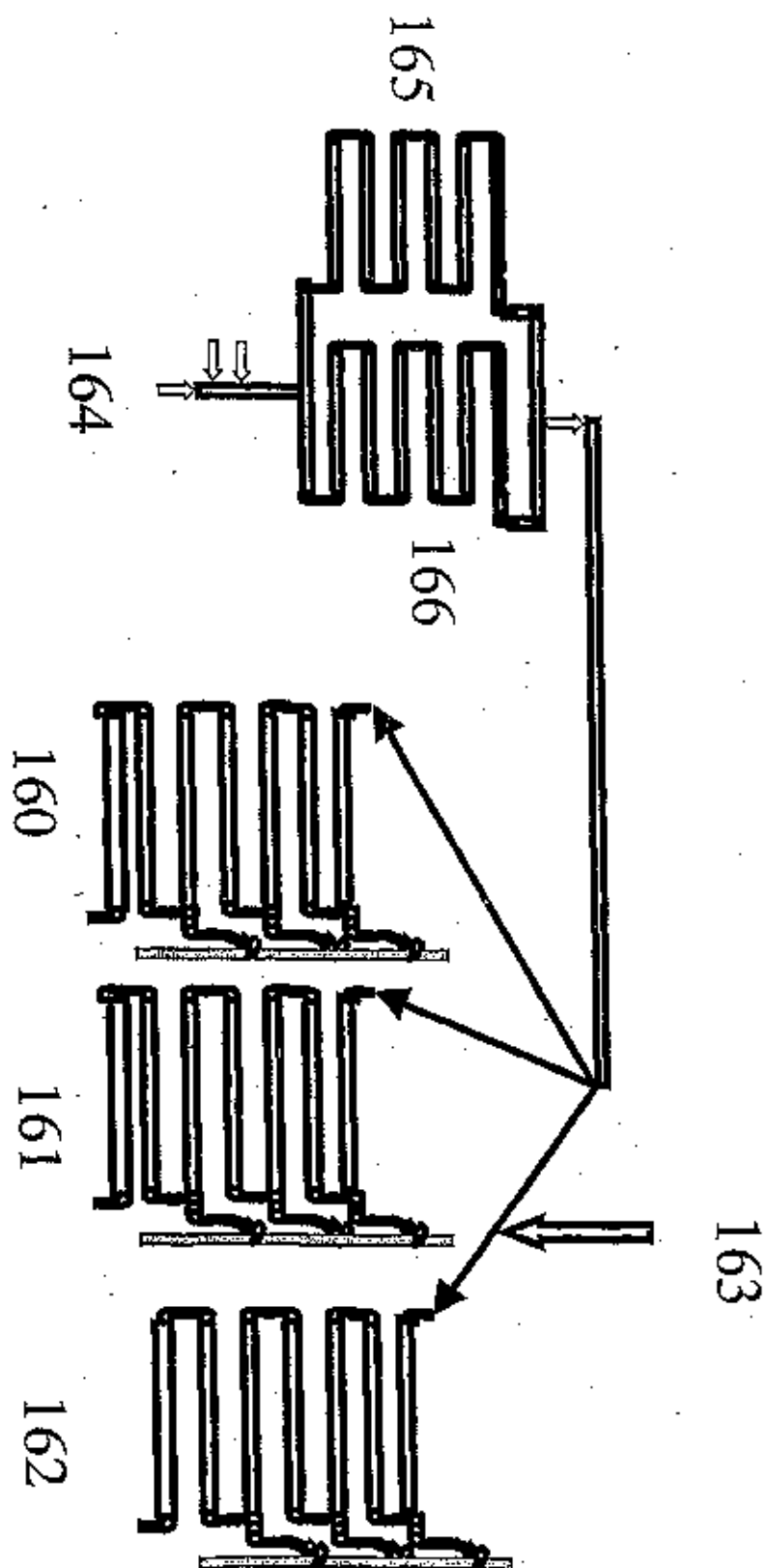


Figure 6: Larger Plants & Multiple Products

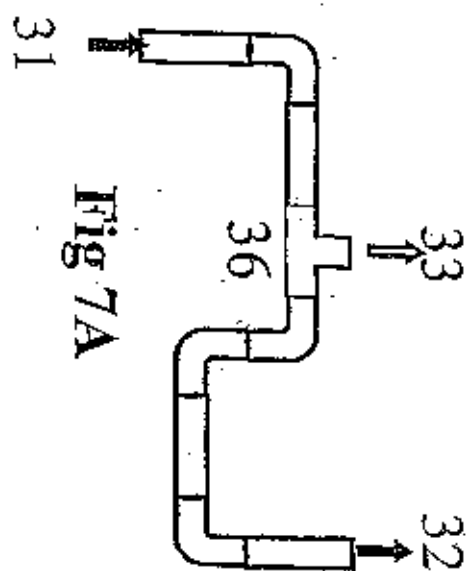


Fig 7A

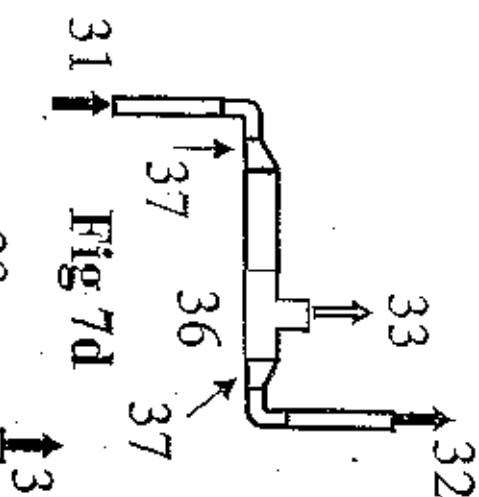


Fig 7d

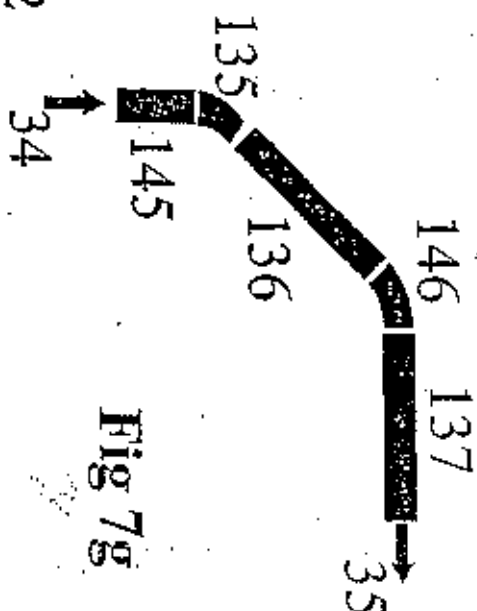


Fig 7g

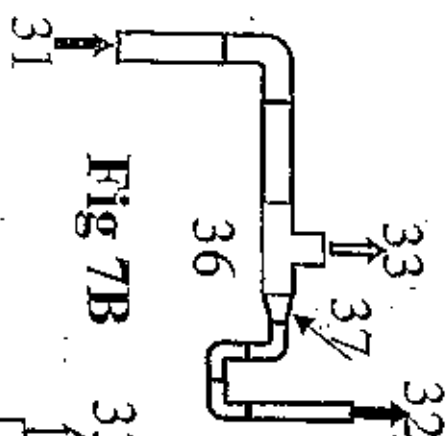


Fig 7B

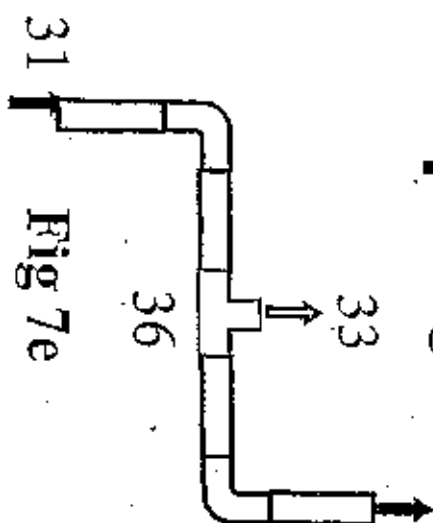


Fig 7e

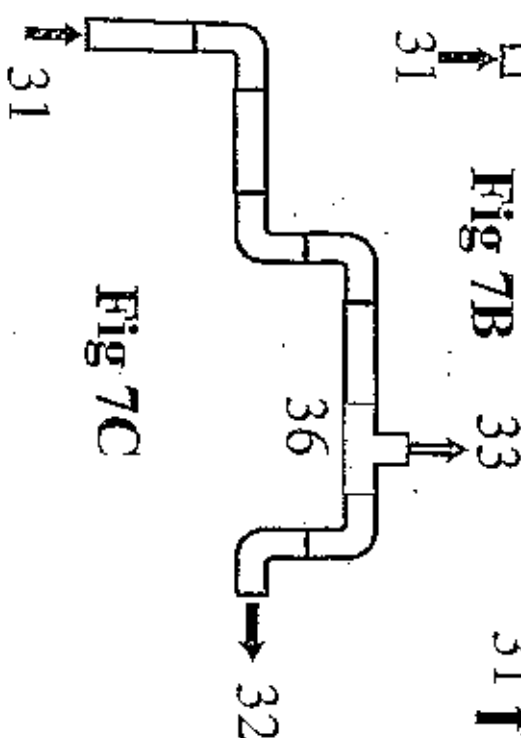


Fig 7C

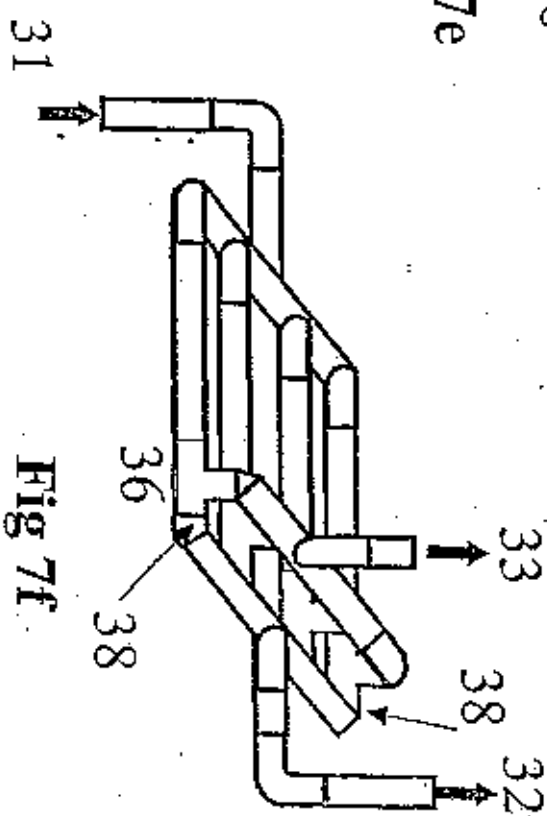


Fig 7f

Figure 7: Vapor Disengagement

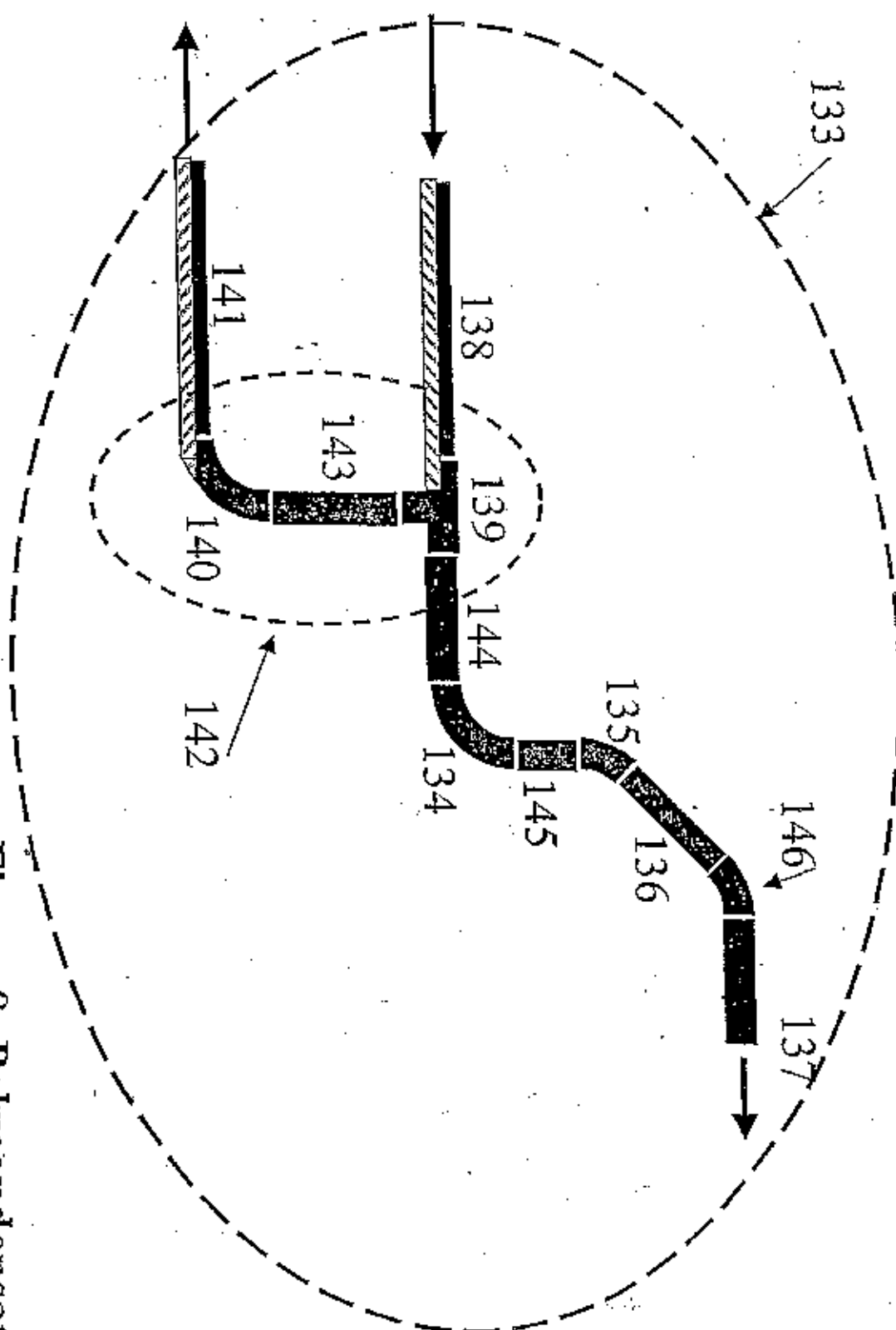


Figure 8: Polycondensation
Vapor Disengagement

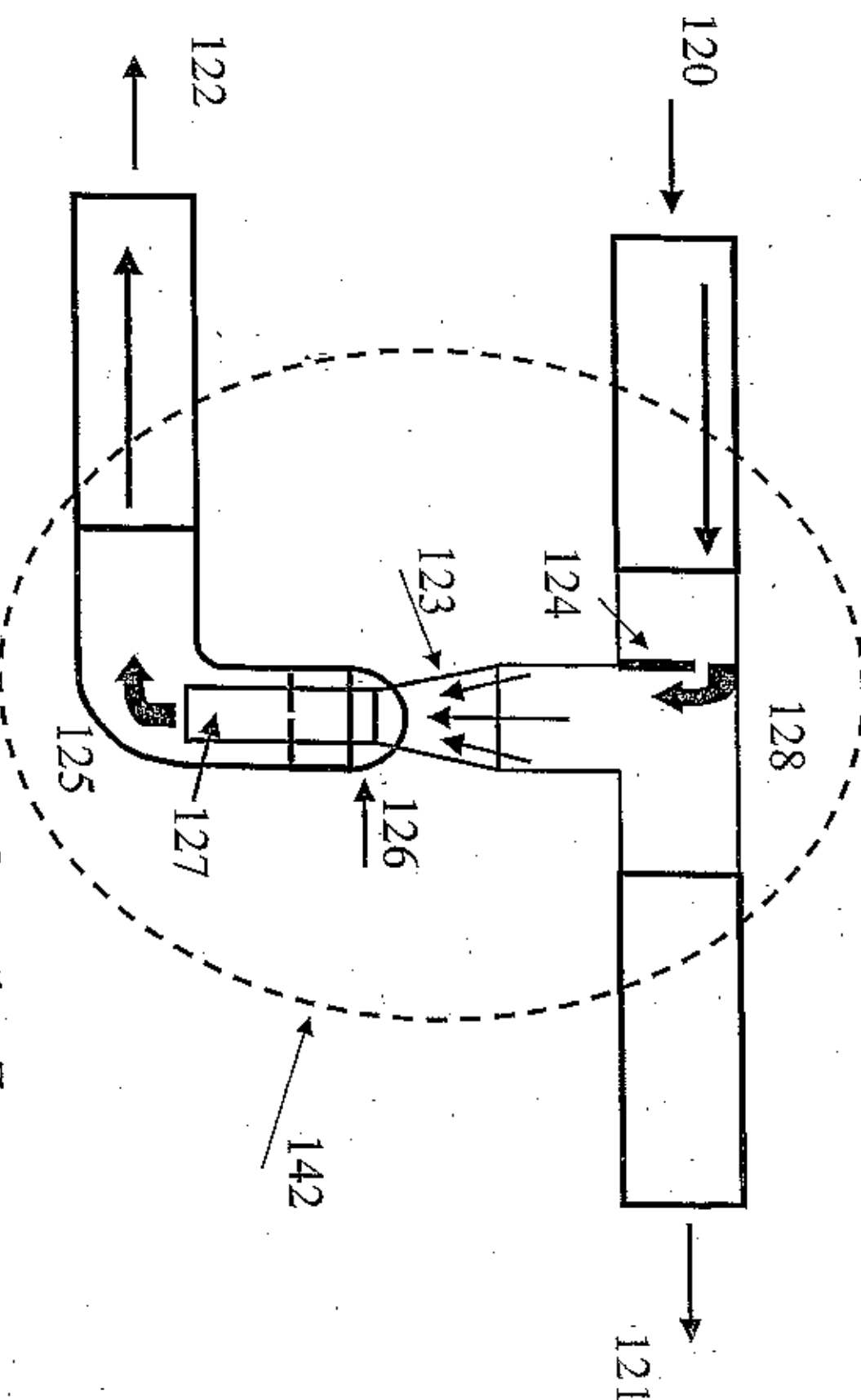


Figure 9: Laminar Mixing in Polycondensation Zones

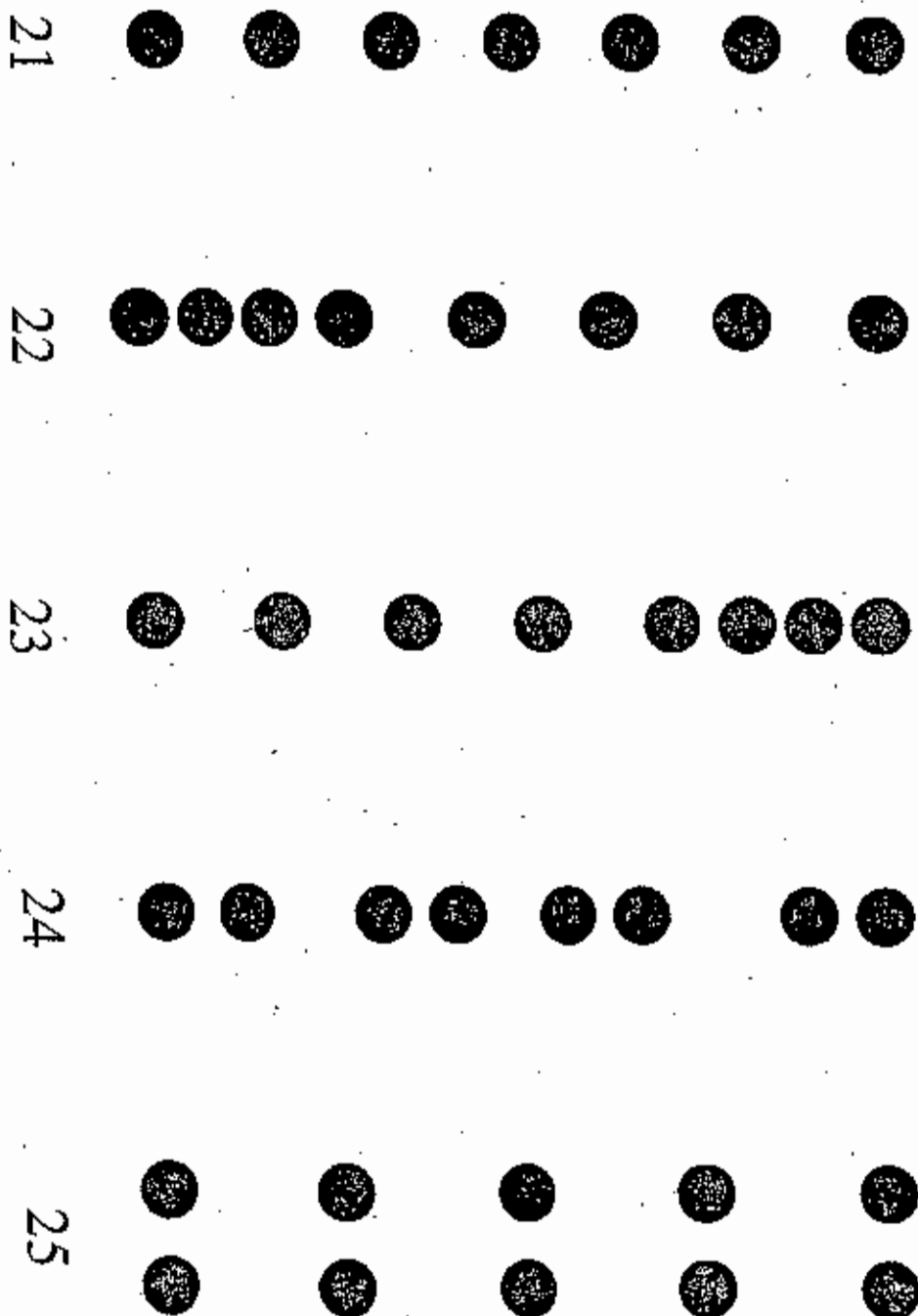
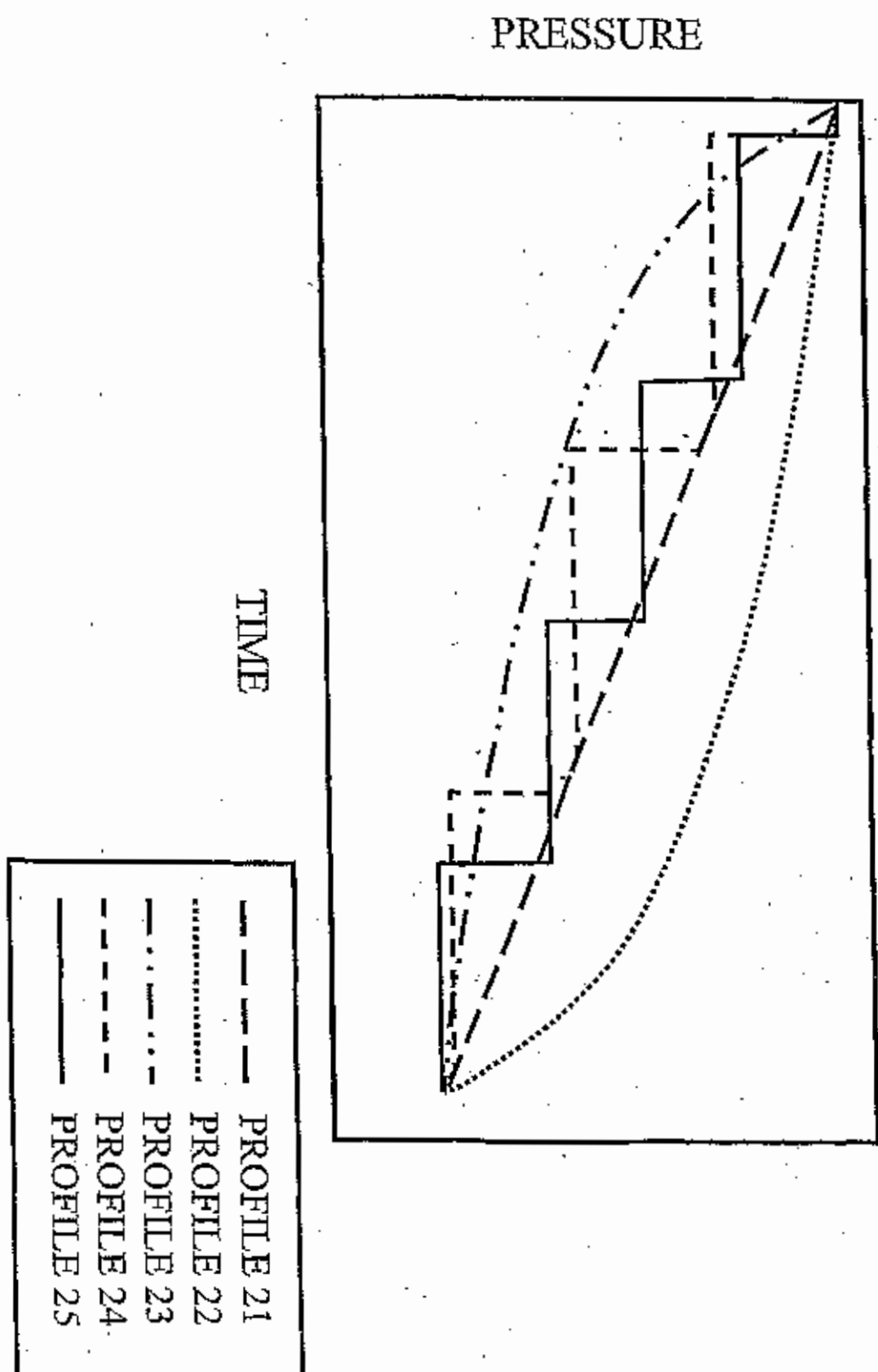


Figure 10: Altering Esterification & Ester
Exchange Reactor Pressure Profile

FIGURE 11: CHANGING PRESSURE PROFILE BY
CHANGING PIPE CONFIGURATION



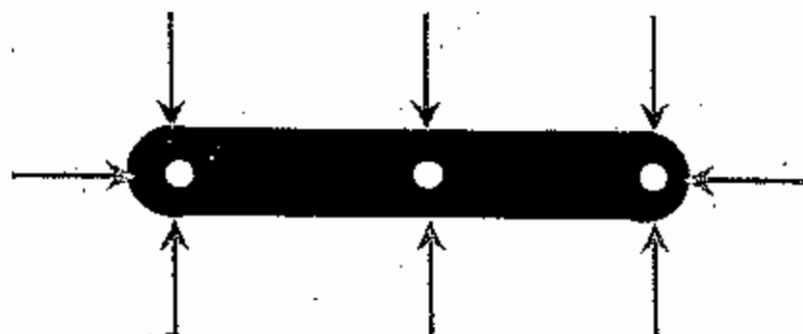


FIGURE 12a

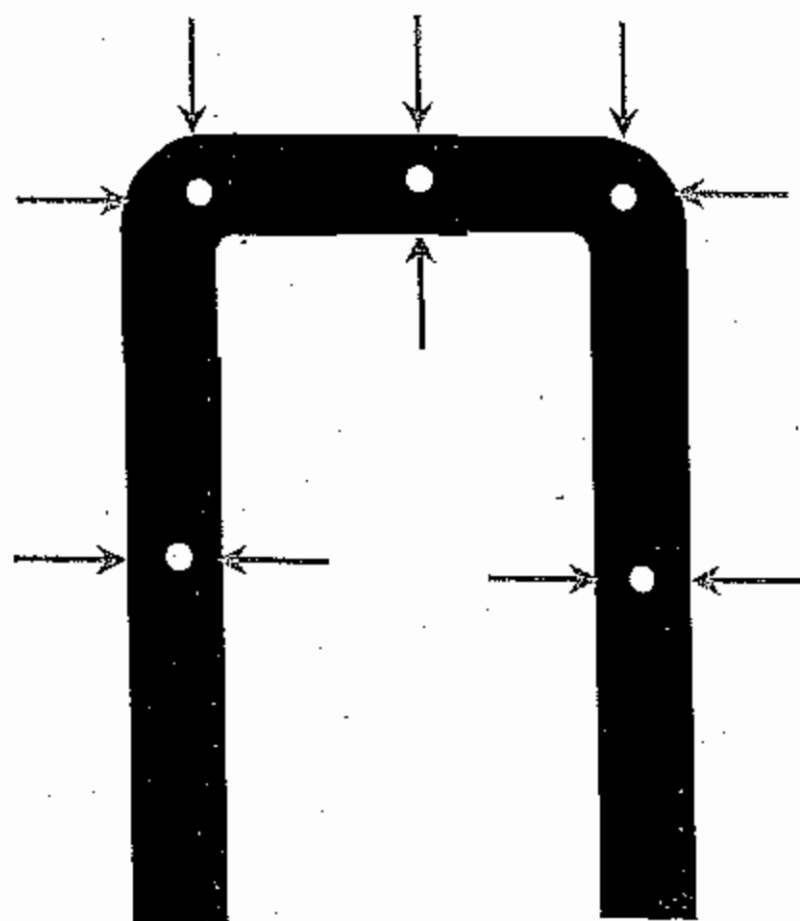


FIGURE 12b

FIGURE 12: ADDITIVE LOCATIONS

Figure 13: Elimination of
Paste Tank

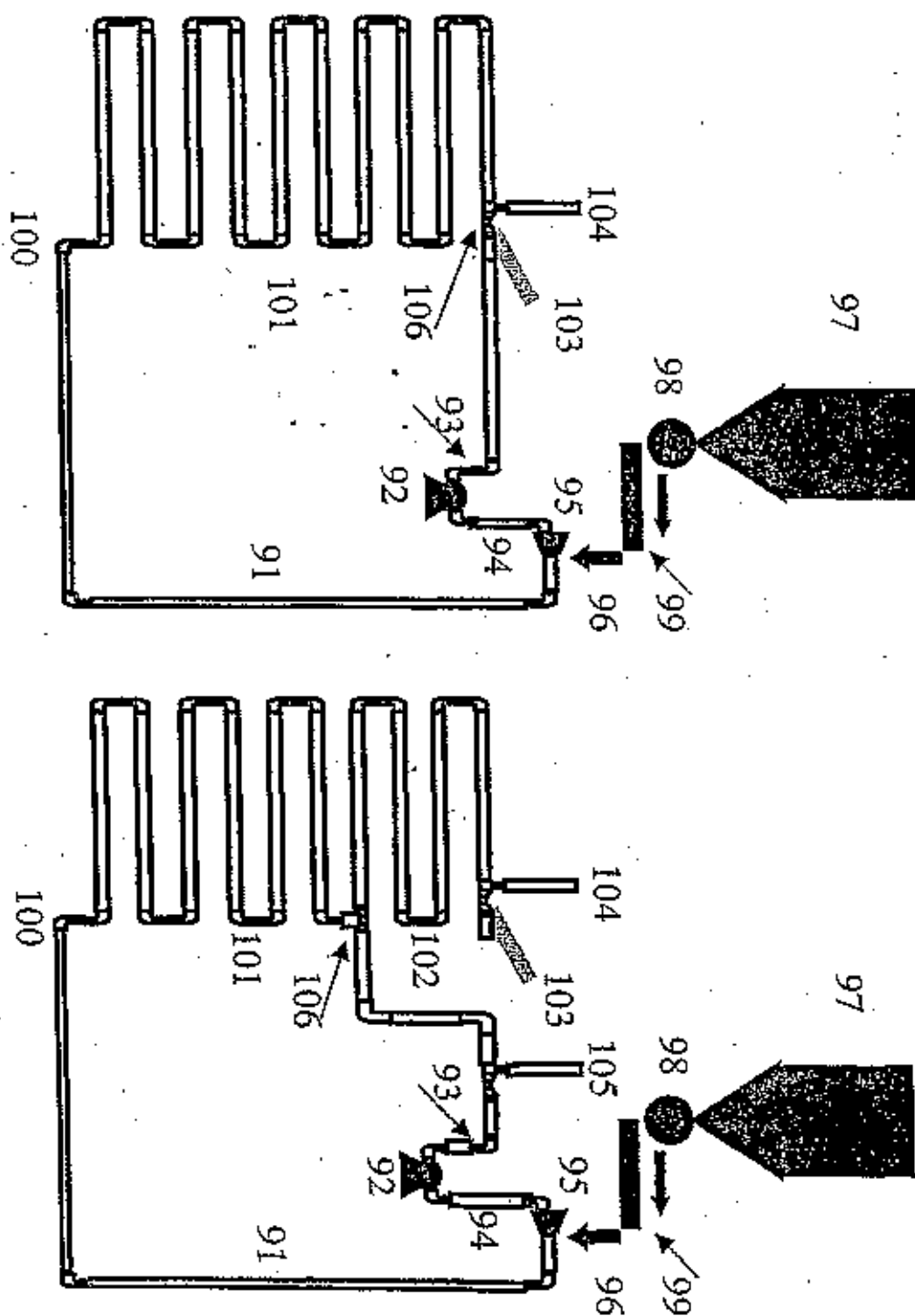


Figure 13a

Figure 13b

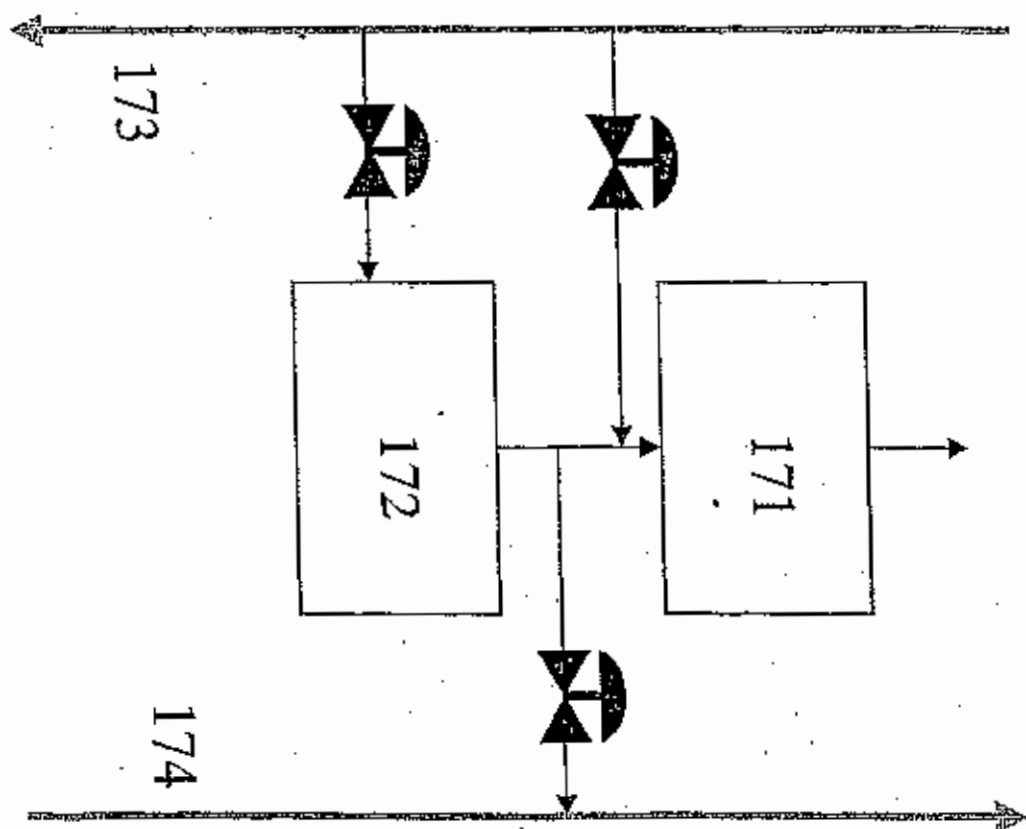
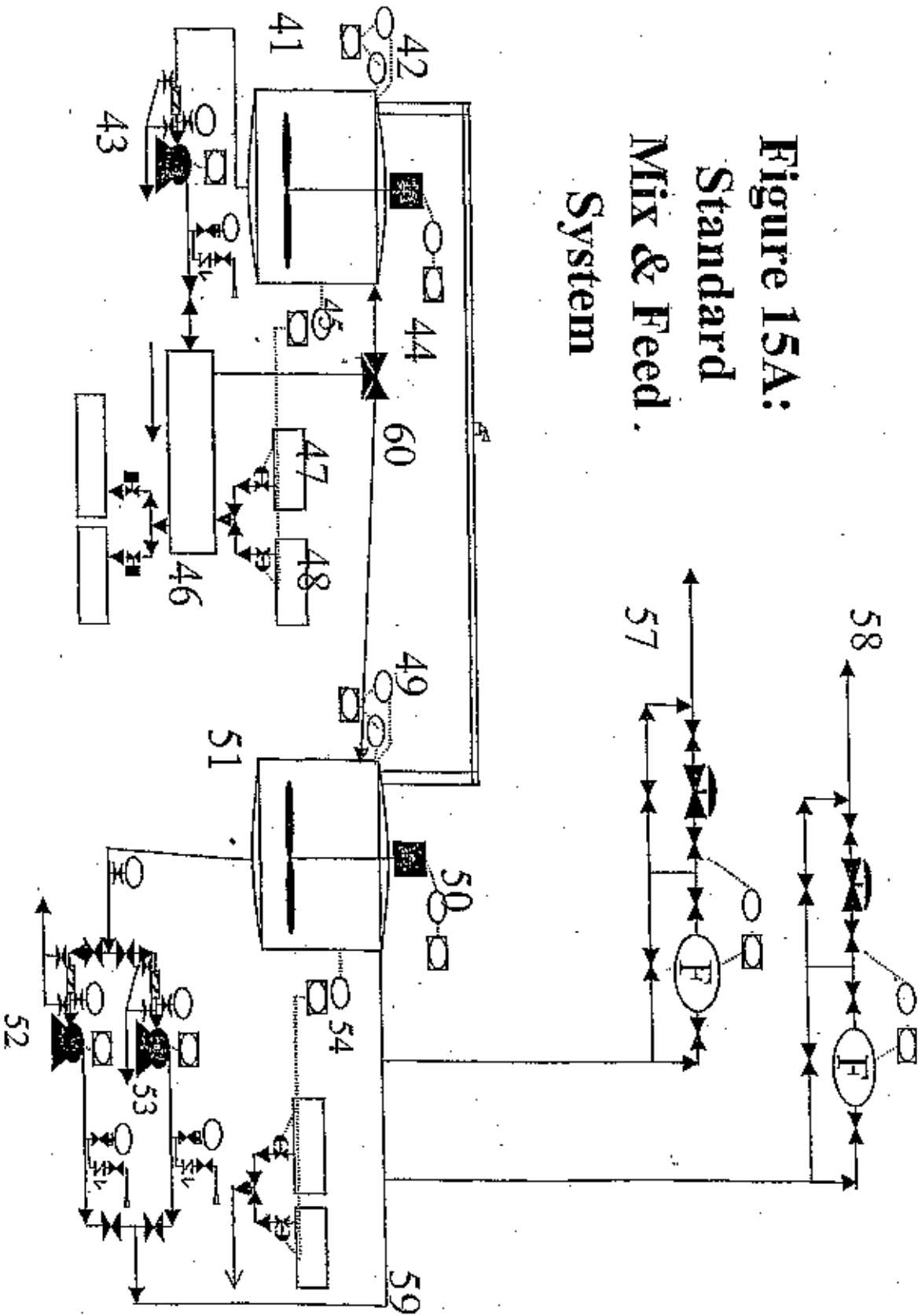


Figure 14: Elimination of Subloop Pumps

Figure 15A:
Standard
Mix & Feed .
System



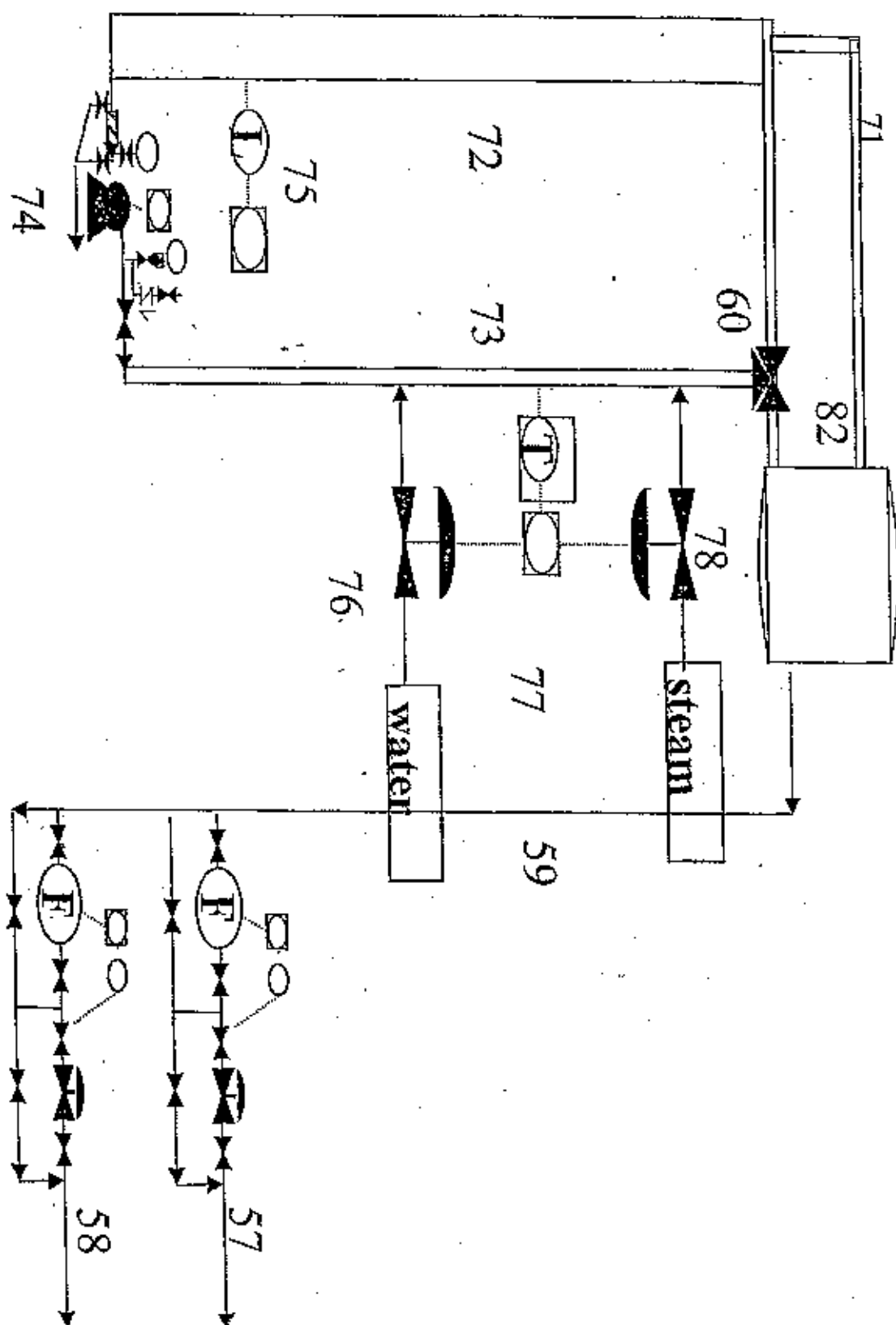


Figure 15B: Mix & Feed System

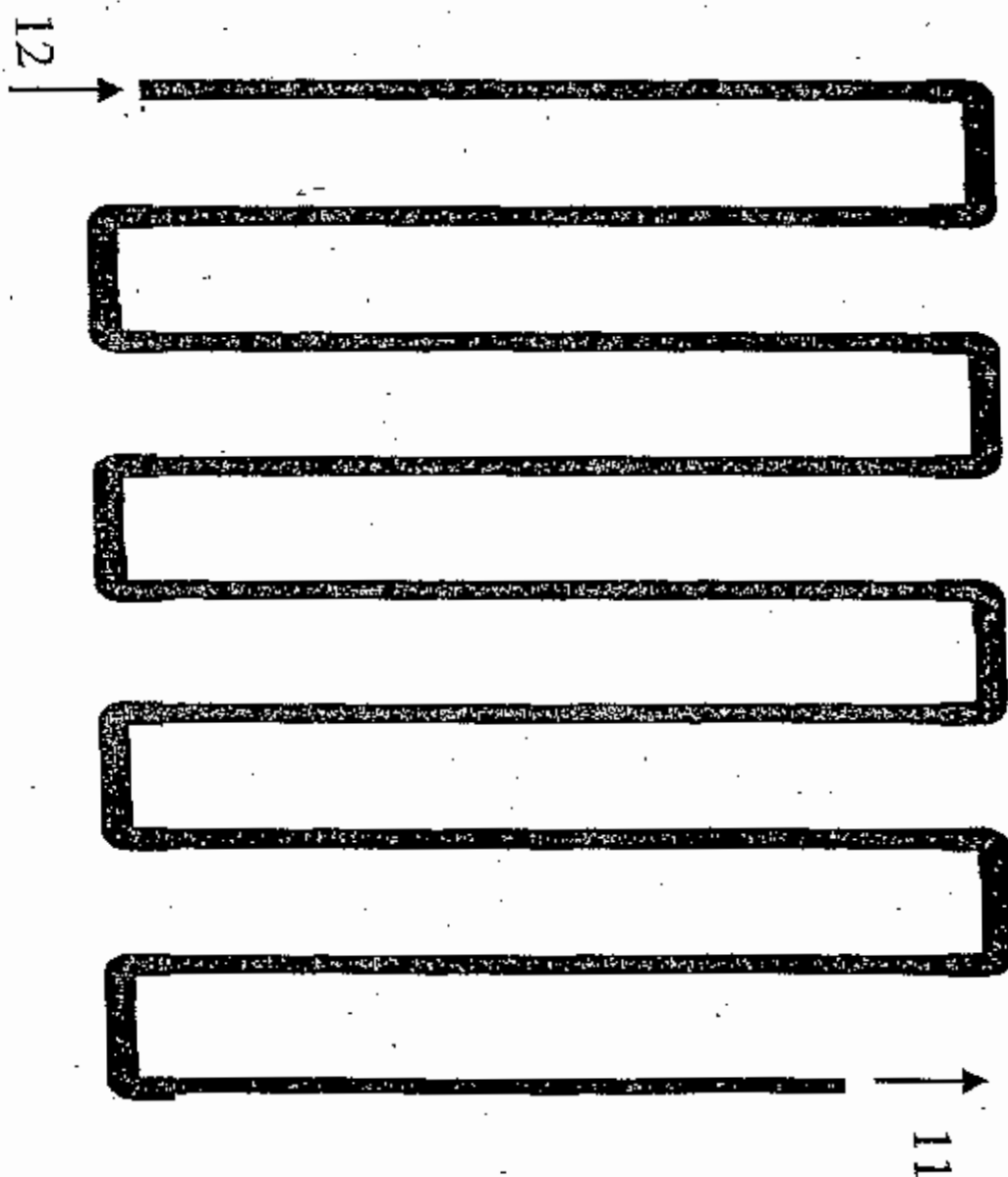


Figure 16: Alternating Low and High Pressure Configuration:
Ester Exchange or Polycondensation Pipe Reactor

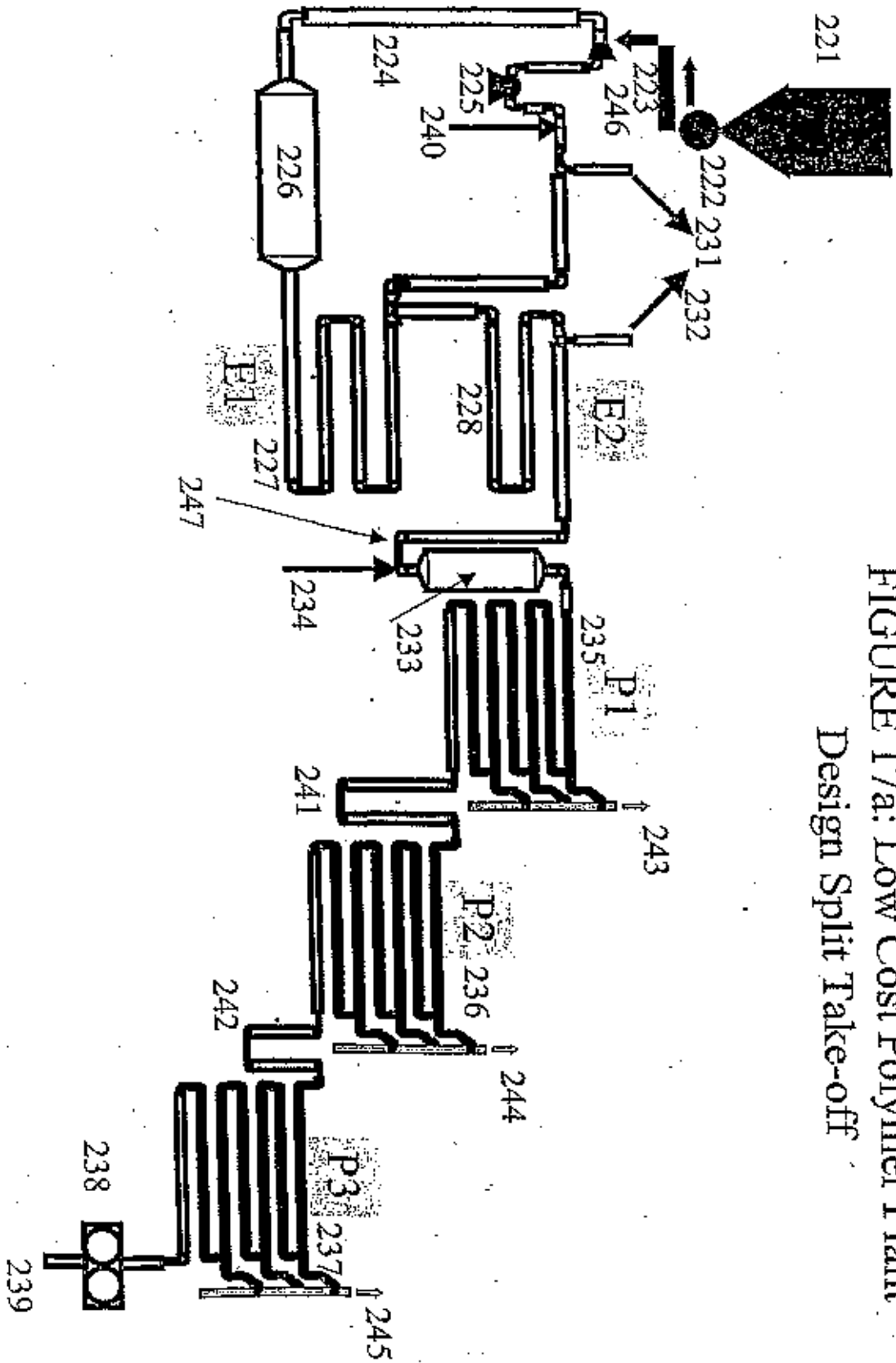


FIGURE 17a: Low Cost Polymer Plant
Design Split Take-off

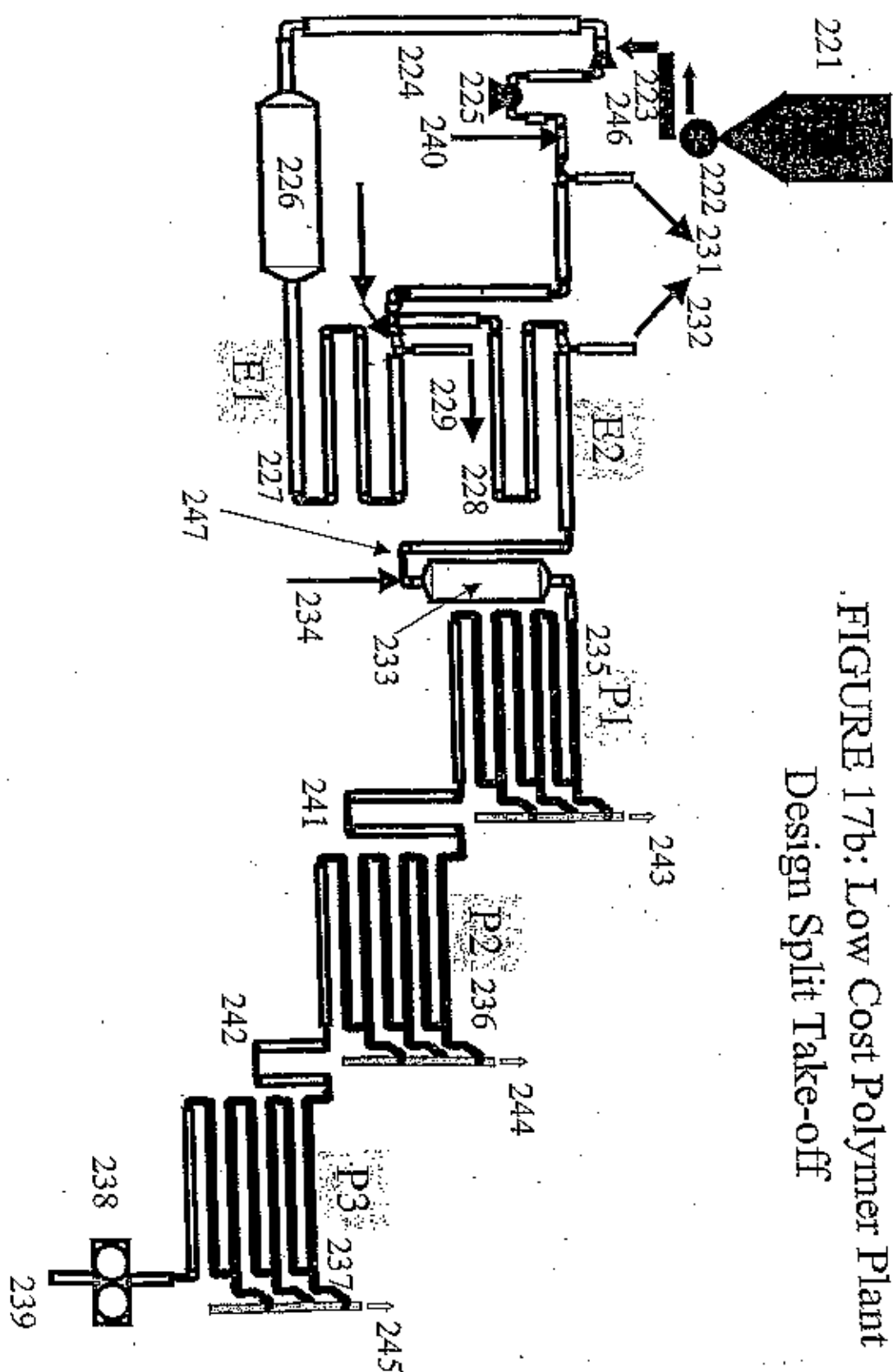


FIGURE 17b: Low Cost Polymer Plant
Design Split Take-off

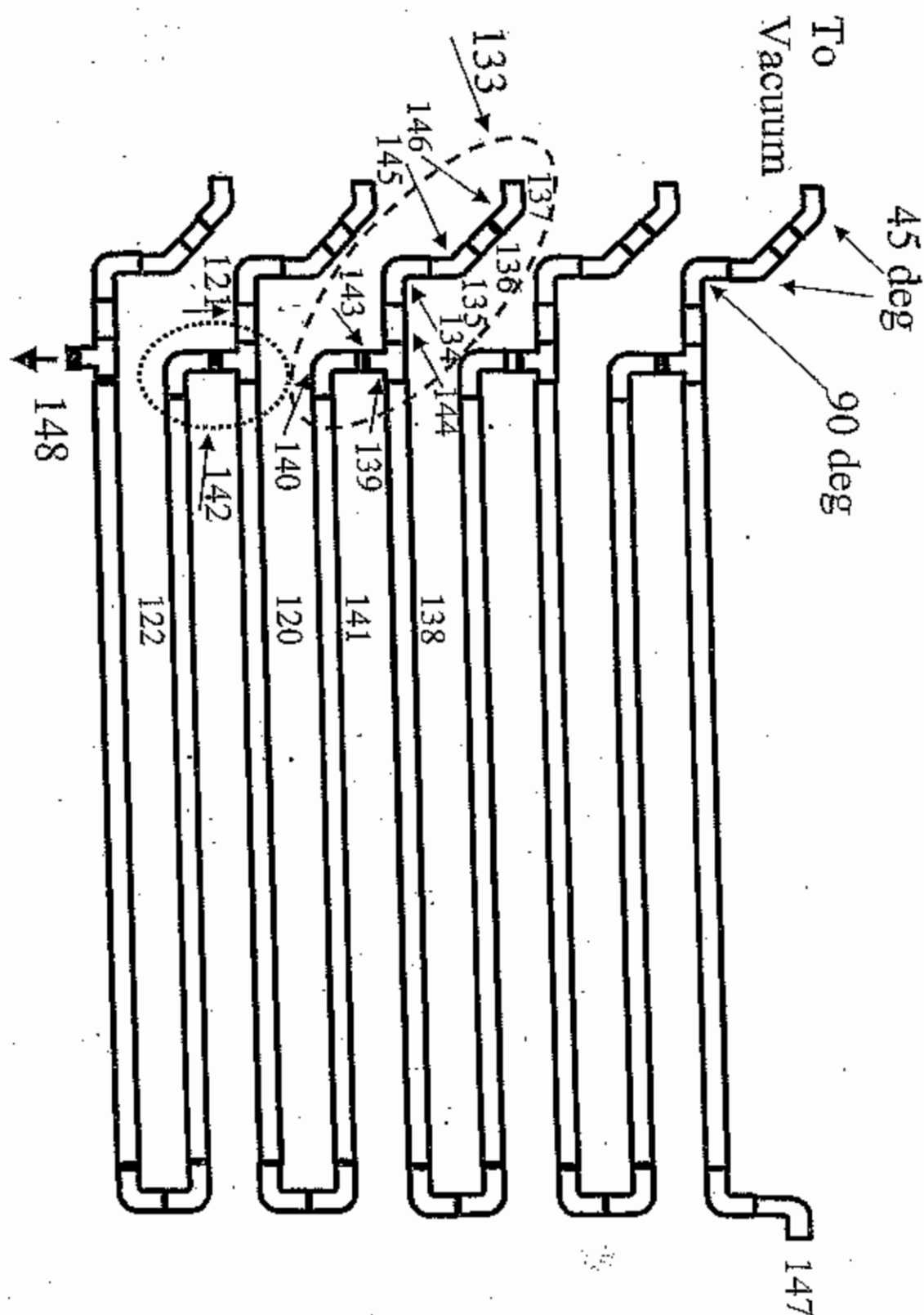


Figure 18: Polycondensation

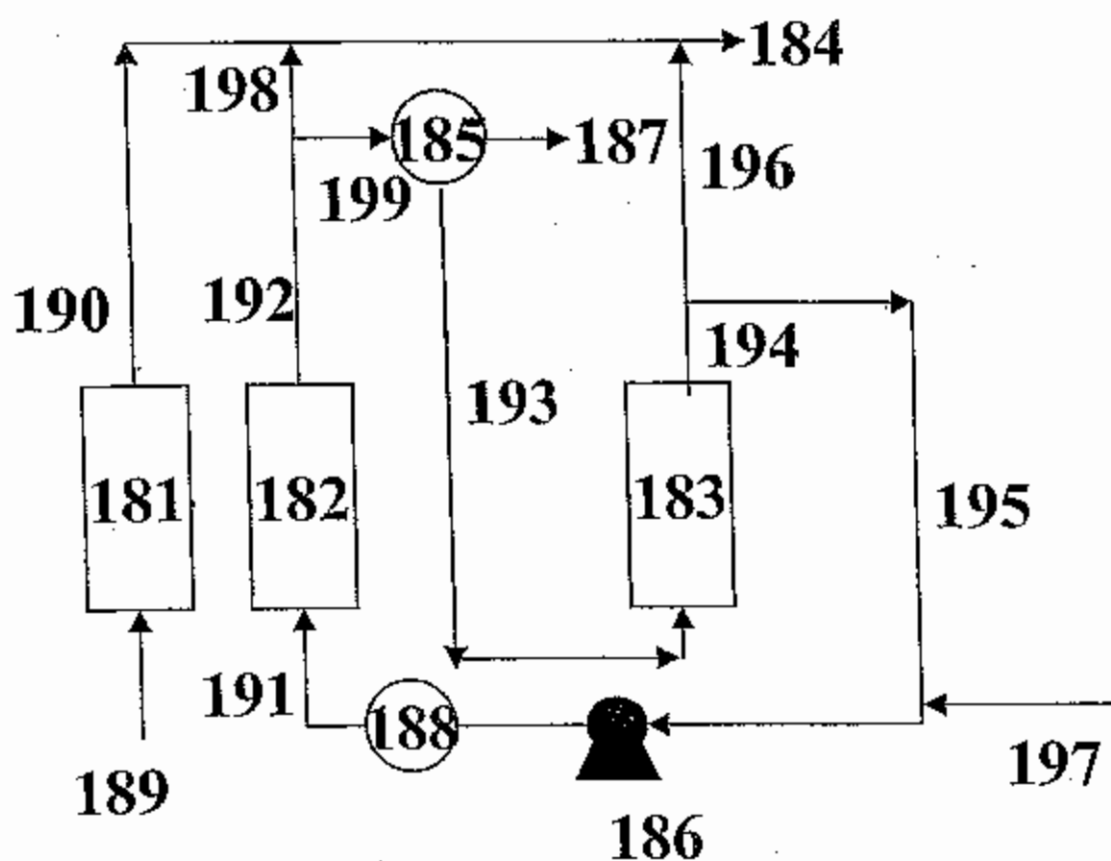


**Figure 19: Replacing
Distillation with Adsorption**

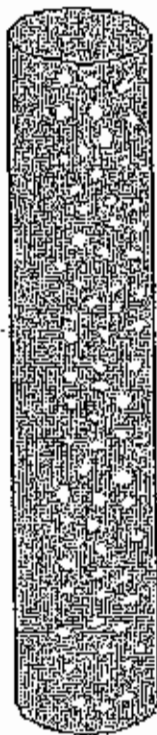
Figure 20A: Flow Regimes of Two-Phase Flow in Horizontal Pipes



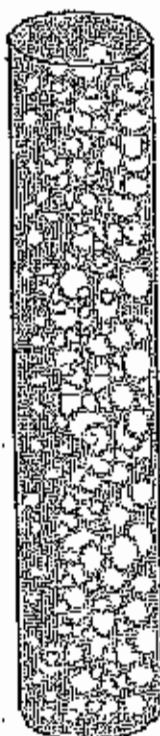
Annular Flow



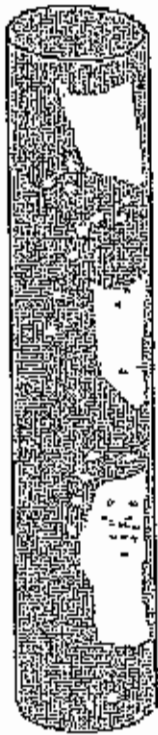
Dispersed Flow



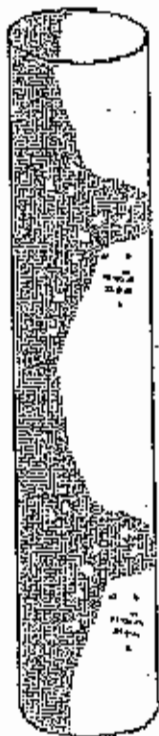
Bubble Flow



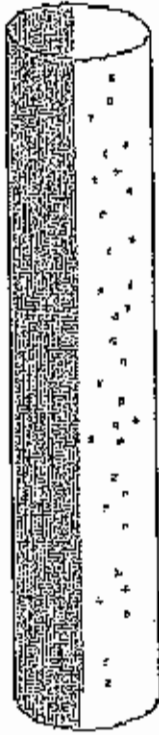
Froth Flow



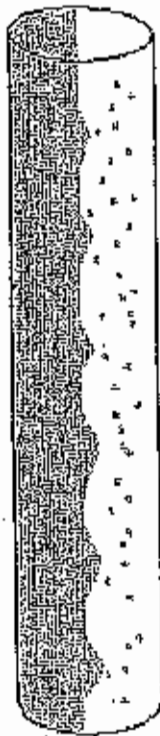
Plug Flow



Slug Flow

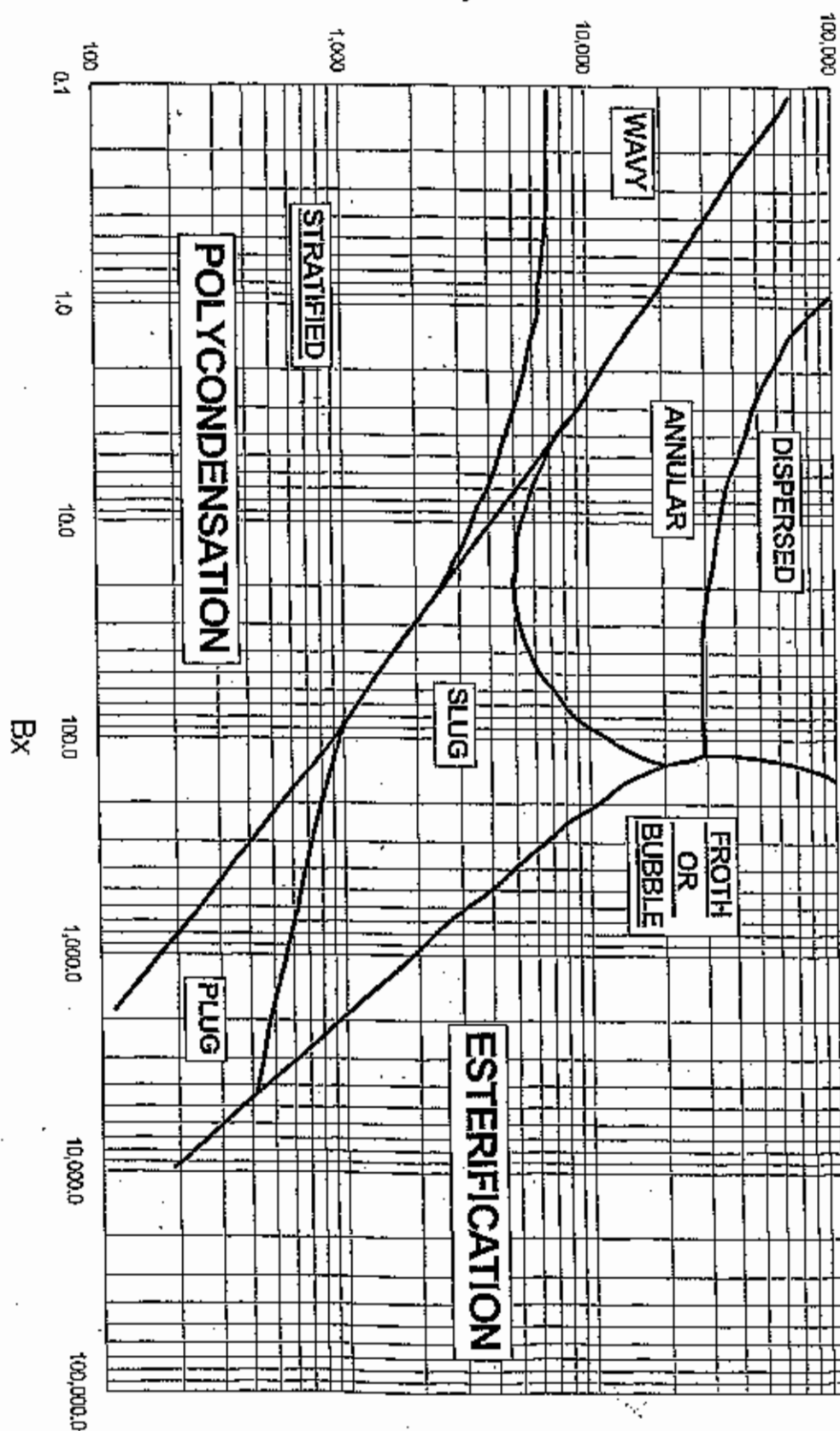


Stratified Flow



Wavy Flow

By



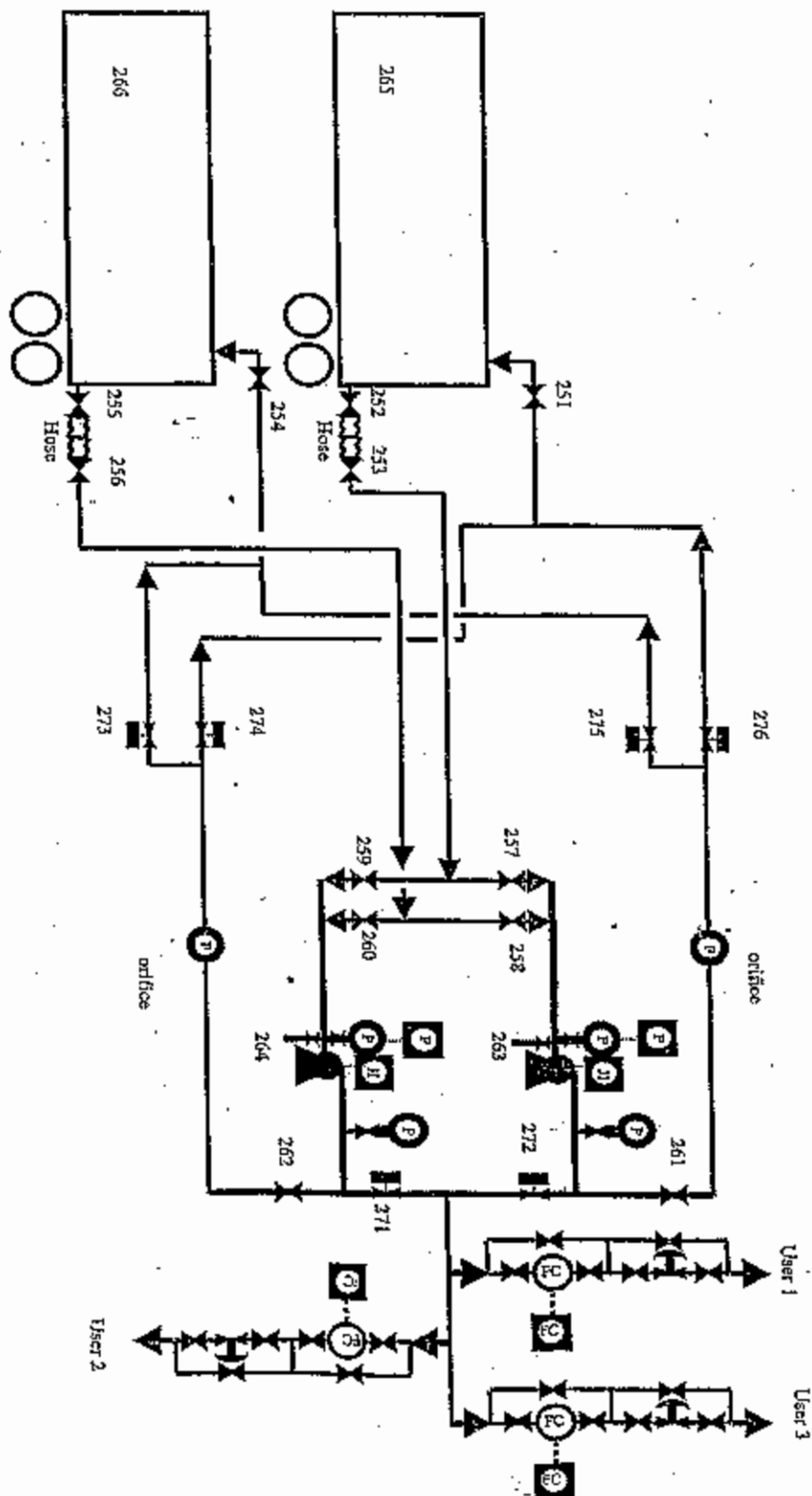


Figure 21: Truck Unloading Without Tanks

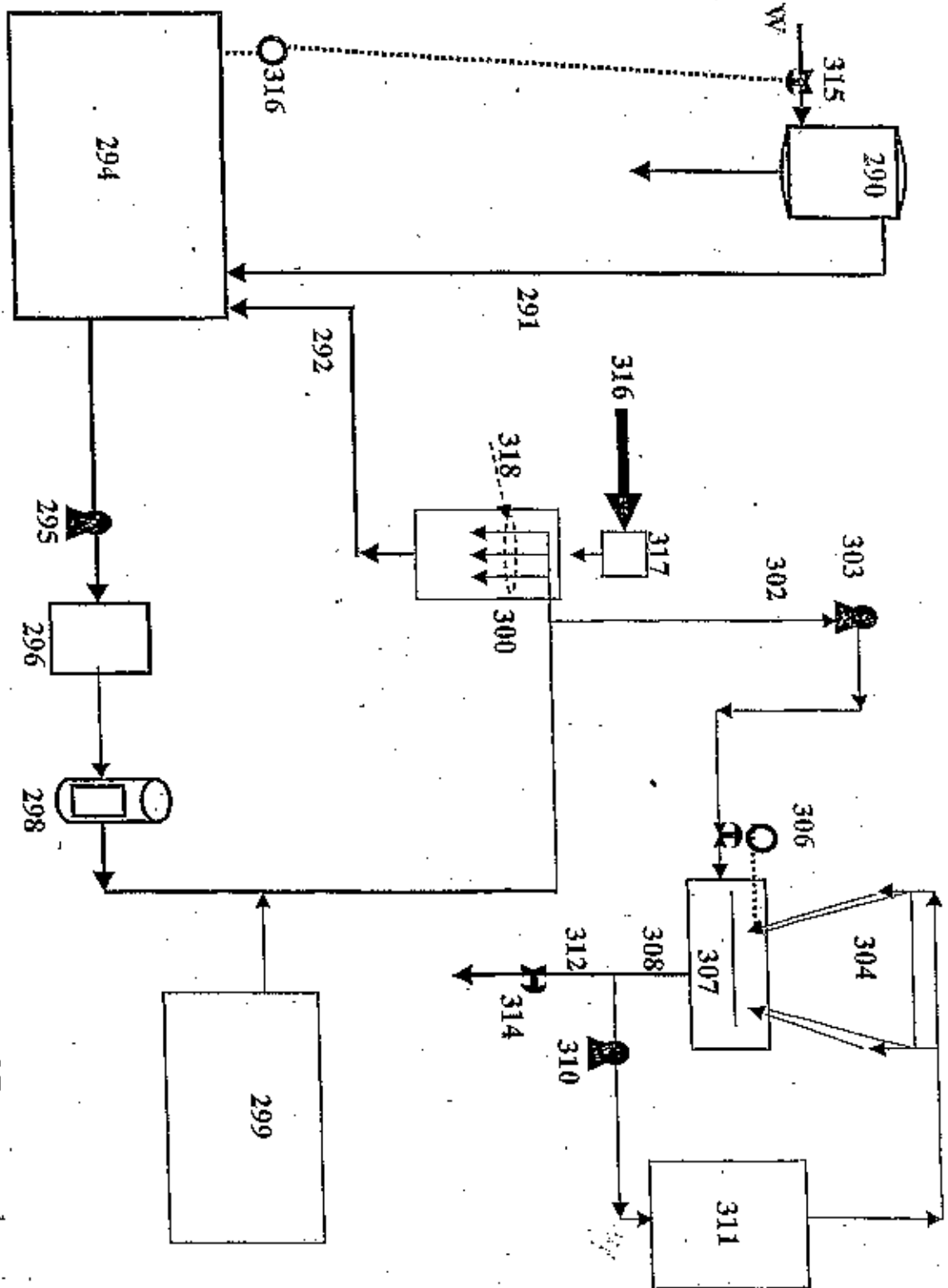


Figure 22: Combining Safety shower, Cooling Tower, Cutter Water, & HTM Pump coolers

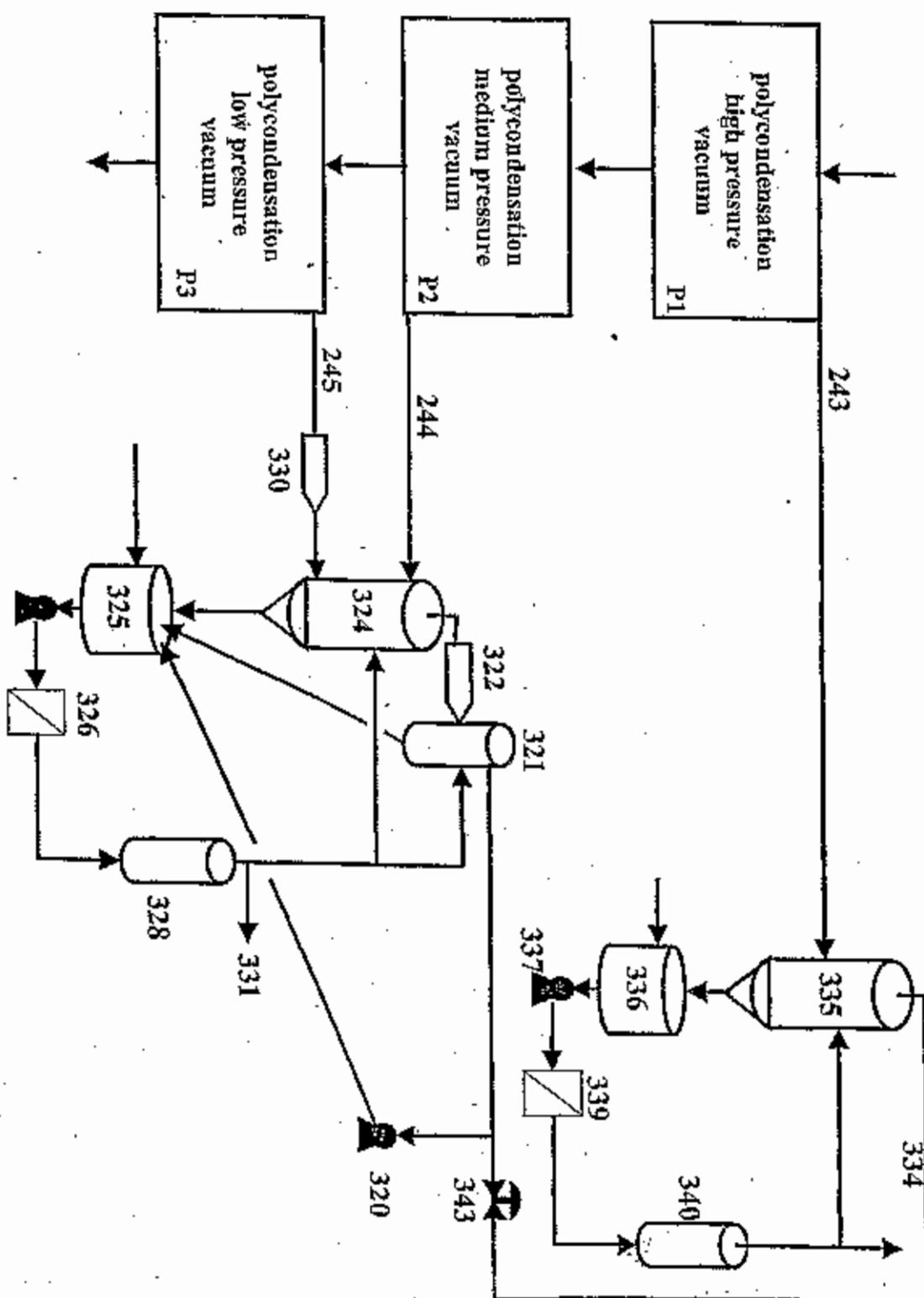


FIGURE 23. Integrated Vacuum system reducing EG Jets & eliminating Chilled Water System

27/27

By

