

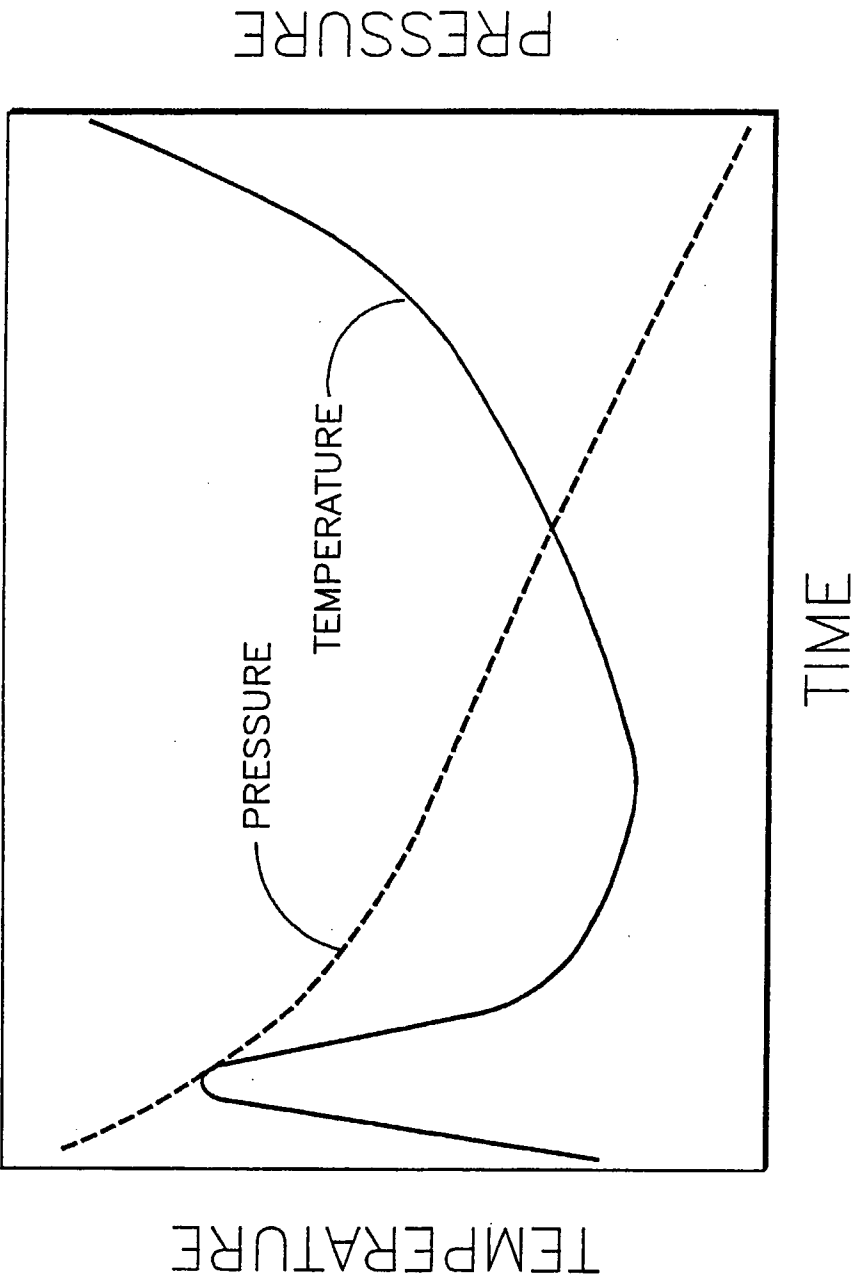


Fig. 1 POLYESTER REACTION TEMPERATURE & PRESSURE PROFILES

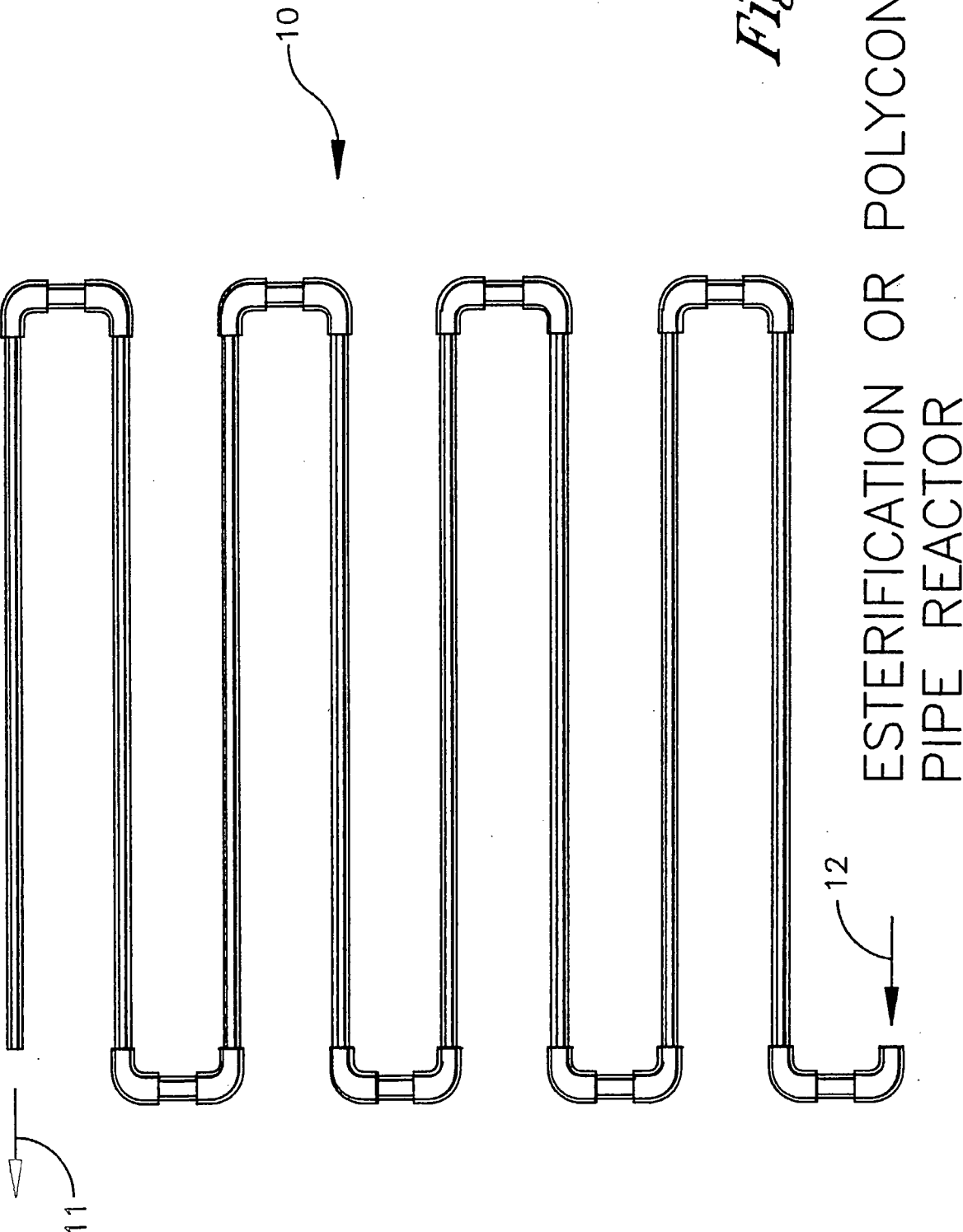


Fig. 2

ESTERIFICATION OR POLYCONDENSATION
PIPE REACTOR

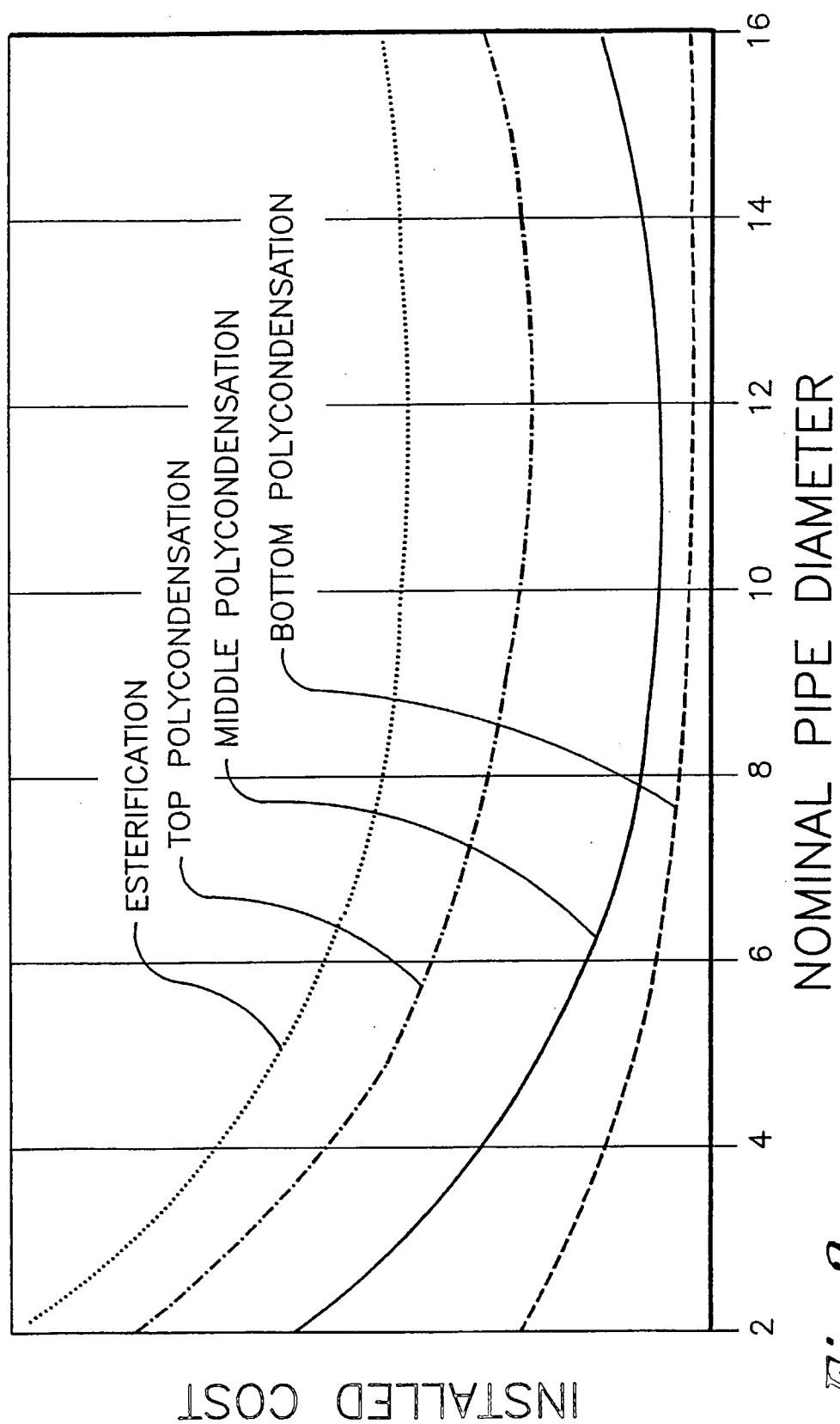


Fig. 3

PIPE REACTOR INSTALLED COST

TOP OF ESTER EXCHANGE OR ESTERIFICATION
REACTOR WHERE LEVEL CONTROL OCCURS
VIA A WEIR INTO THE POLYCONDENSATION REACTOR

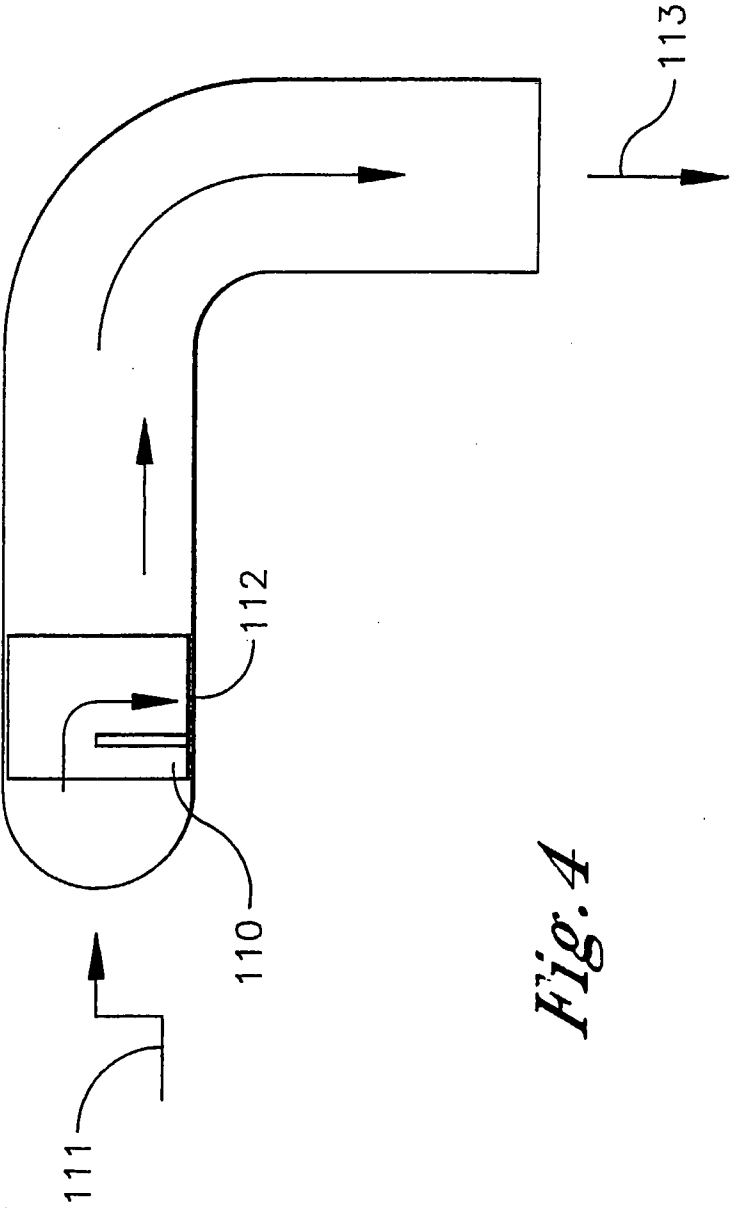


Fig. 4

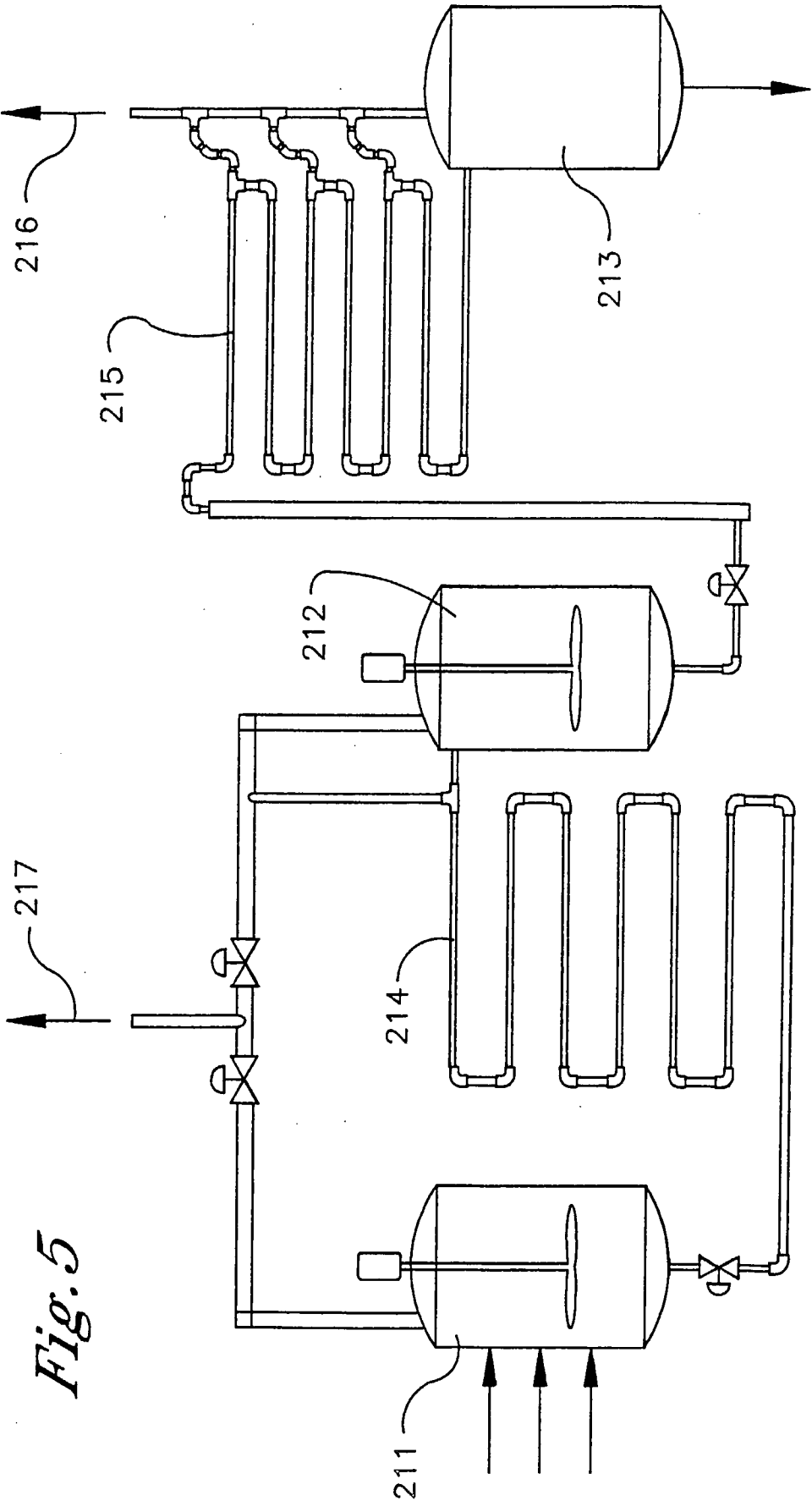
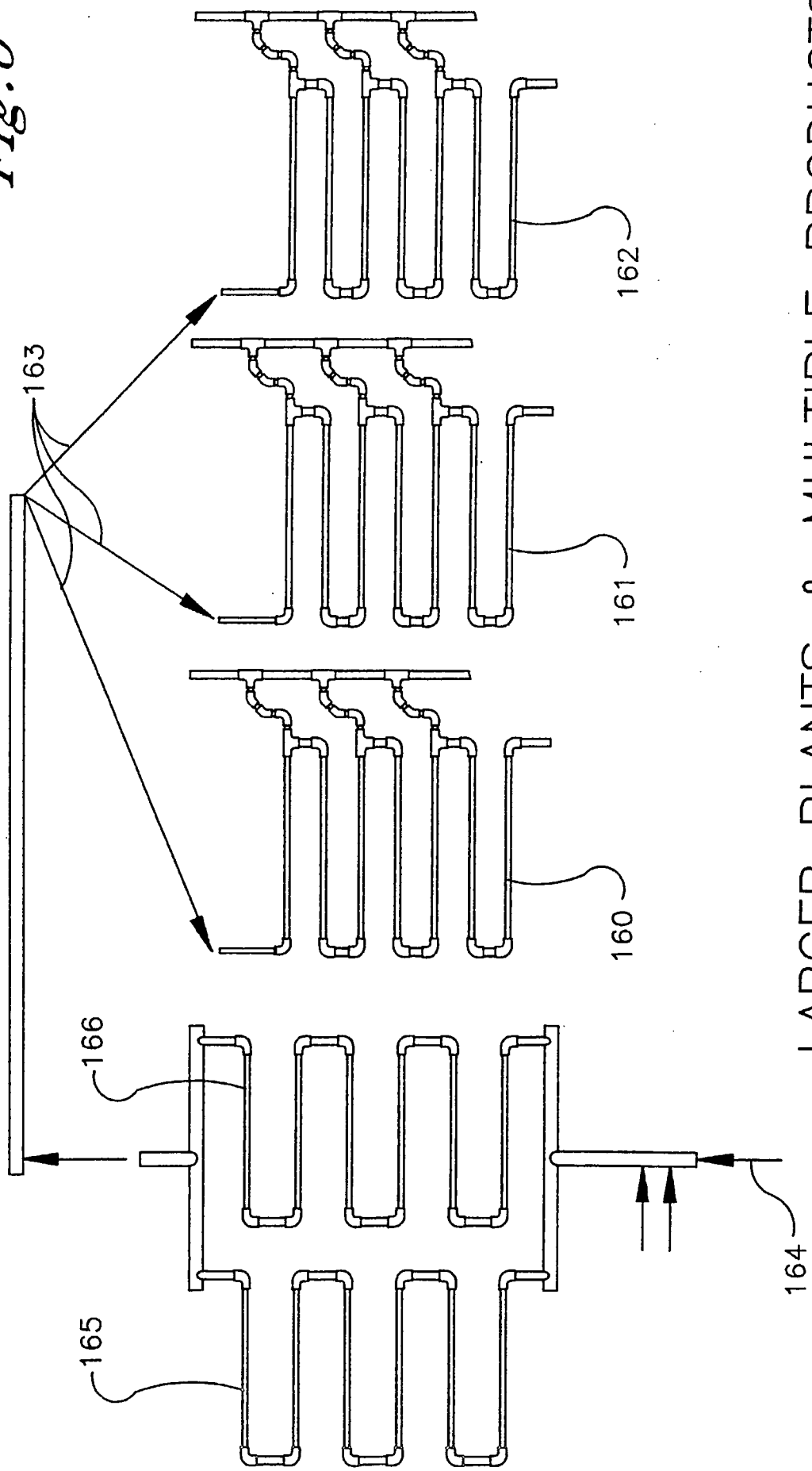


Fig. 5

MODIFYING EXISTING LINES WITH PIPE REACTOR

Fig. 6



LARGER PLANTS & MULTIPLE PRODUCTS

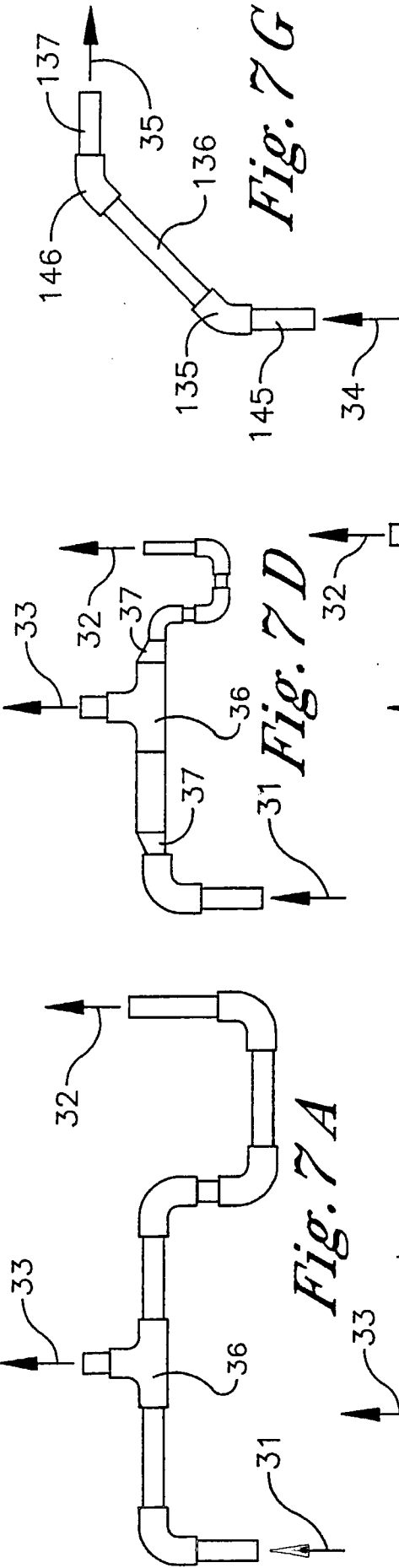


Fig. 7A Fig. 7B Fig. 7C VAPOR DISSENGAGEMENT

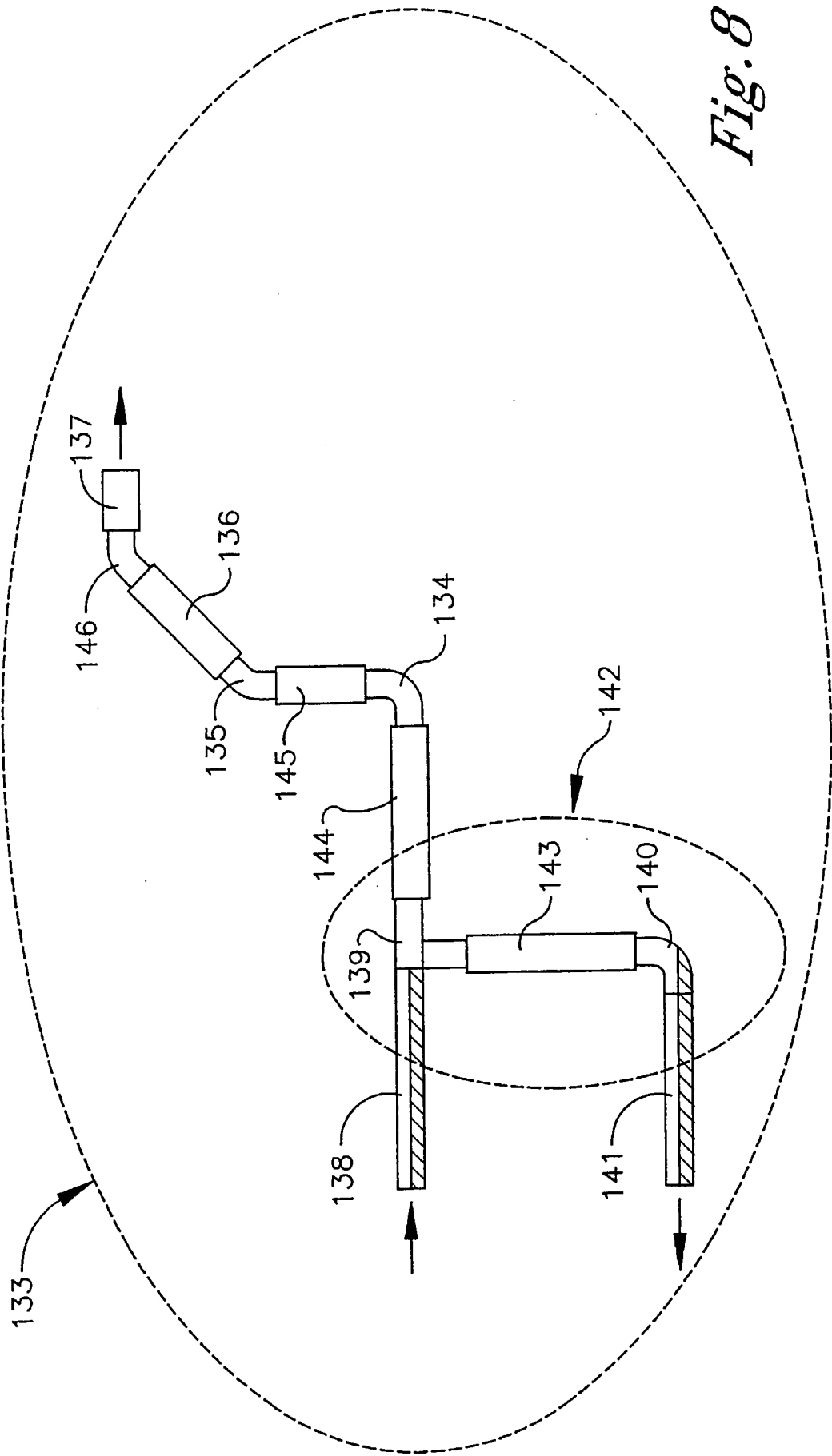


Fig. 8

POLYCONDENSATION VAPOR DISENGAGEMENT

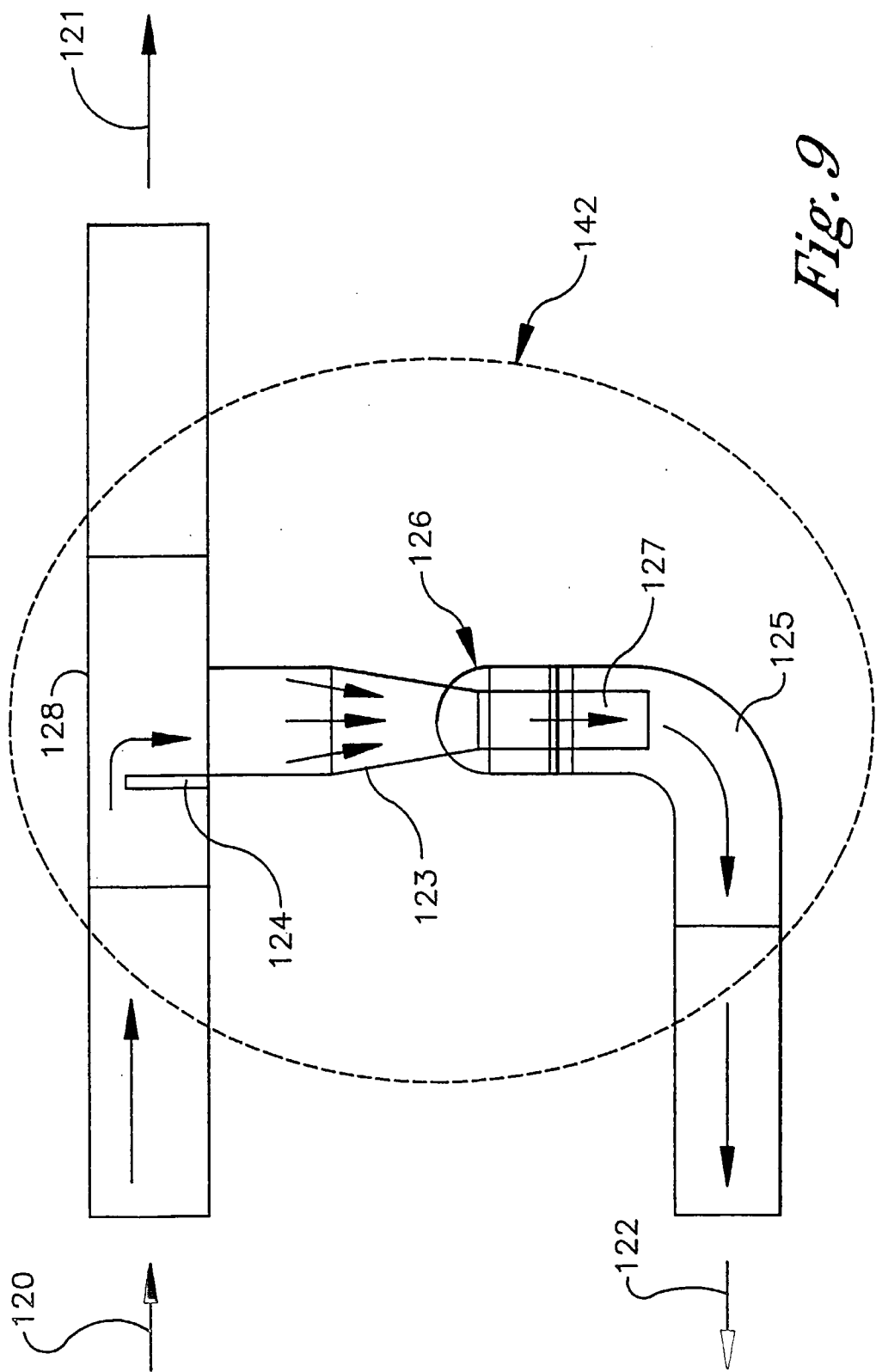


Fig. 9

LAMINAR MIXING IN
POLYCONDENSATION ZONES

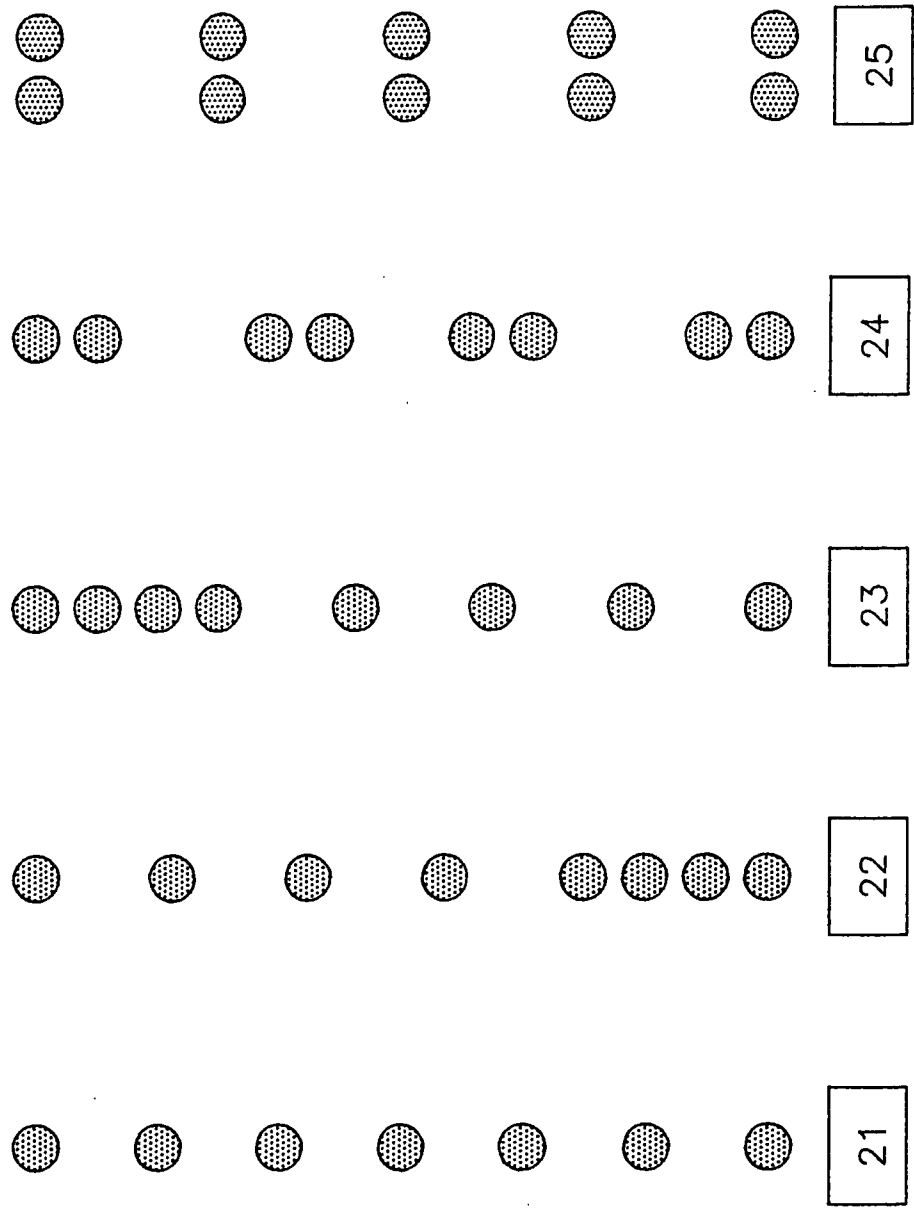


Fig. 10 ALTERING ESTERIFICATION & ESTER EXCHANGE REACTOR PRESSURE PROFILE

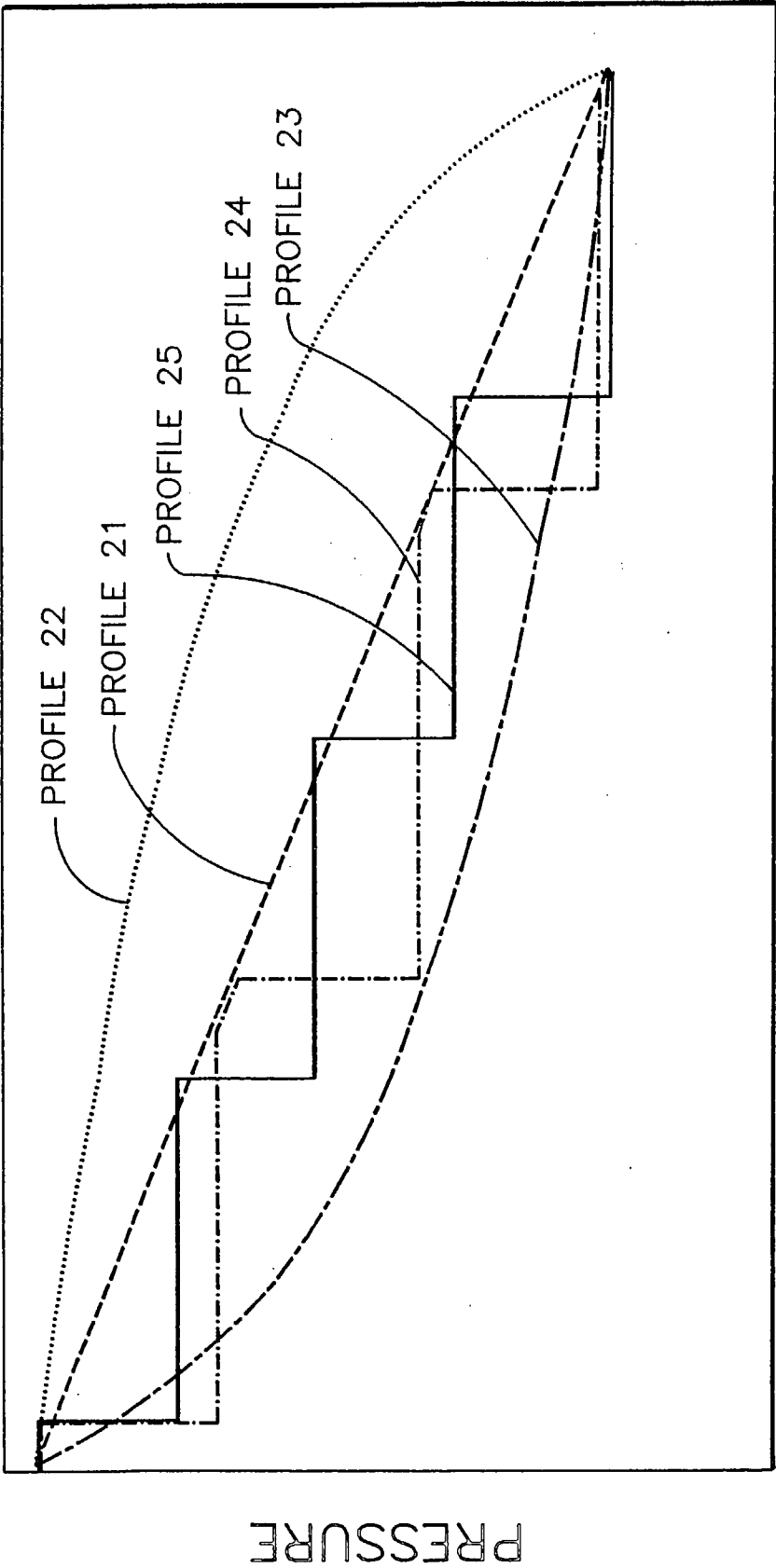


Fig. 11
CHANGING PRESSURE PROFILE BY
CHANGING PIPE CONFIGURATION

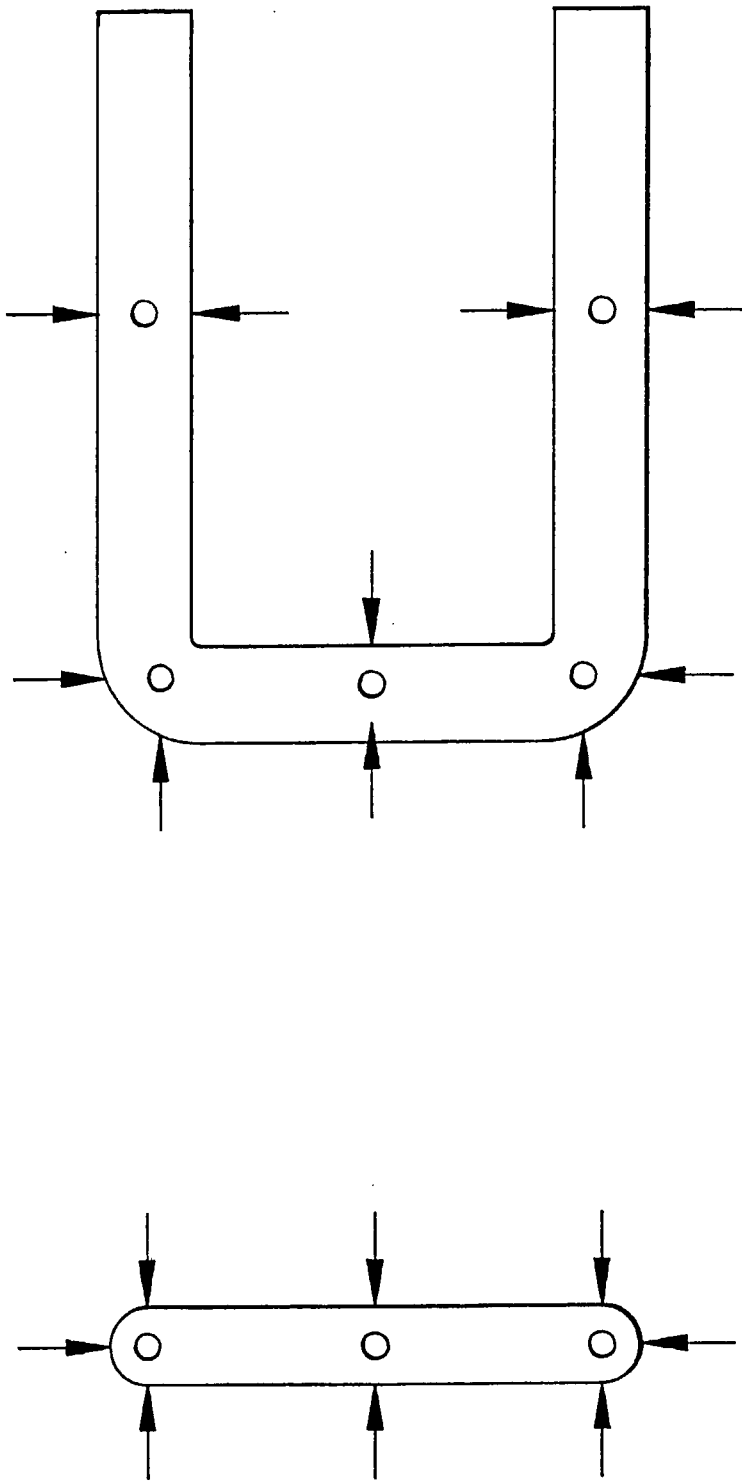


Fig. 12A

Fig. 12B

ADDITIVE LOCATIONS

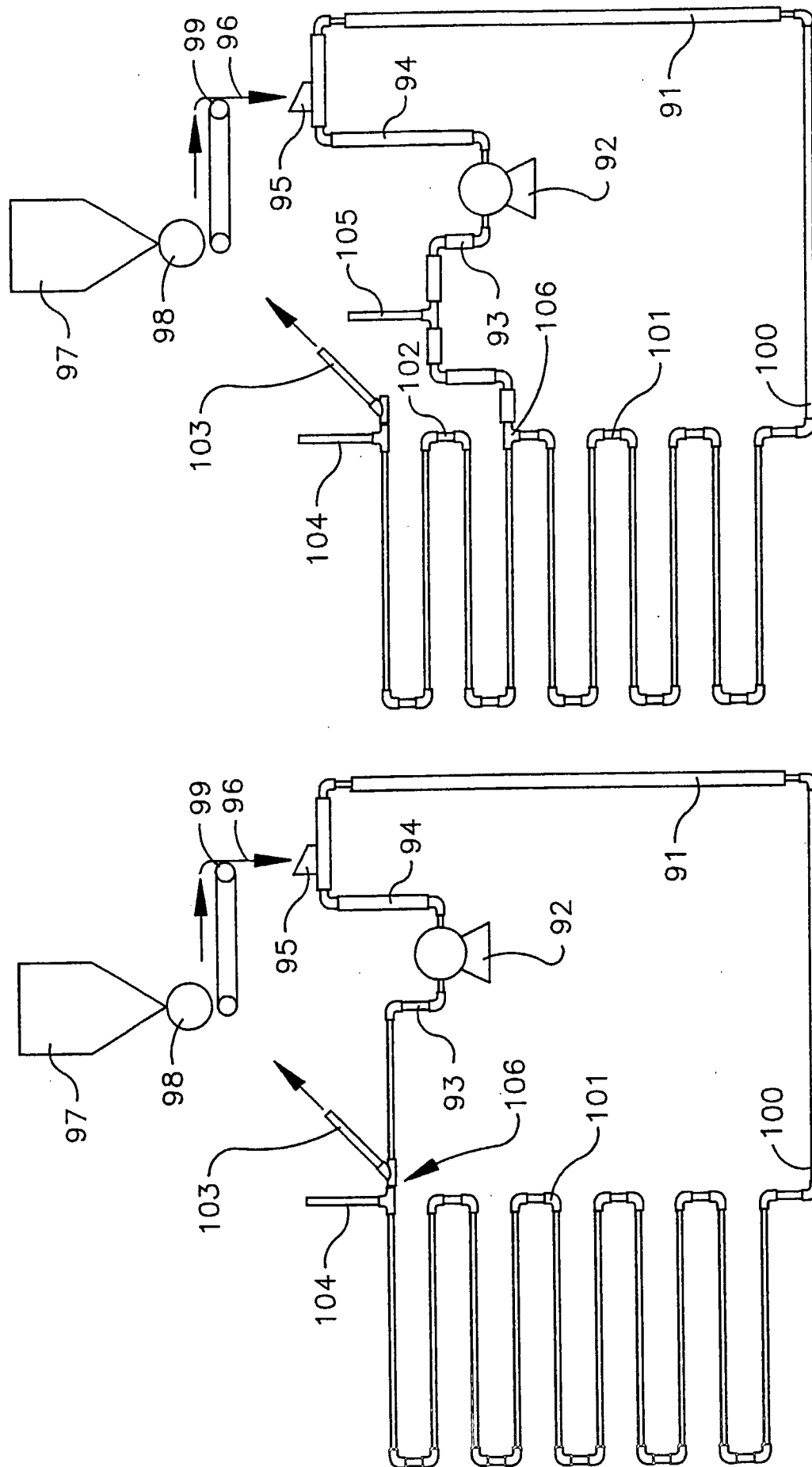


Fig. 13 B

Fig. 13 A

ELIMINATION OF PASTE TANK

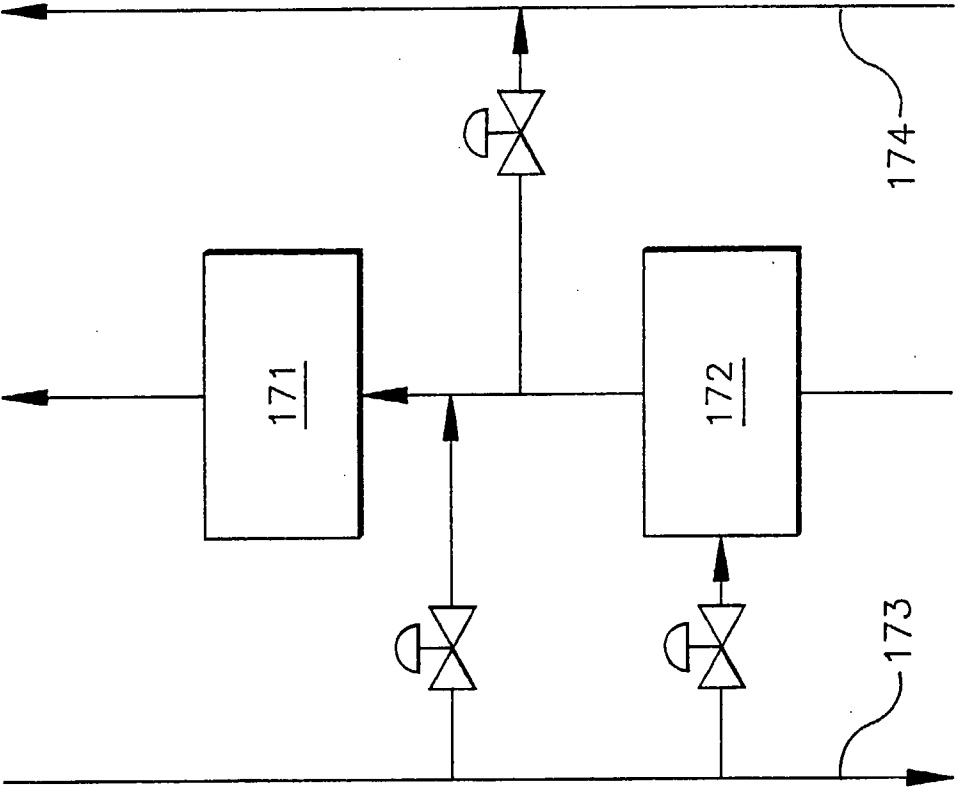


Fig. 14

ELIMINATION OF SUBLOOP PUMPS

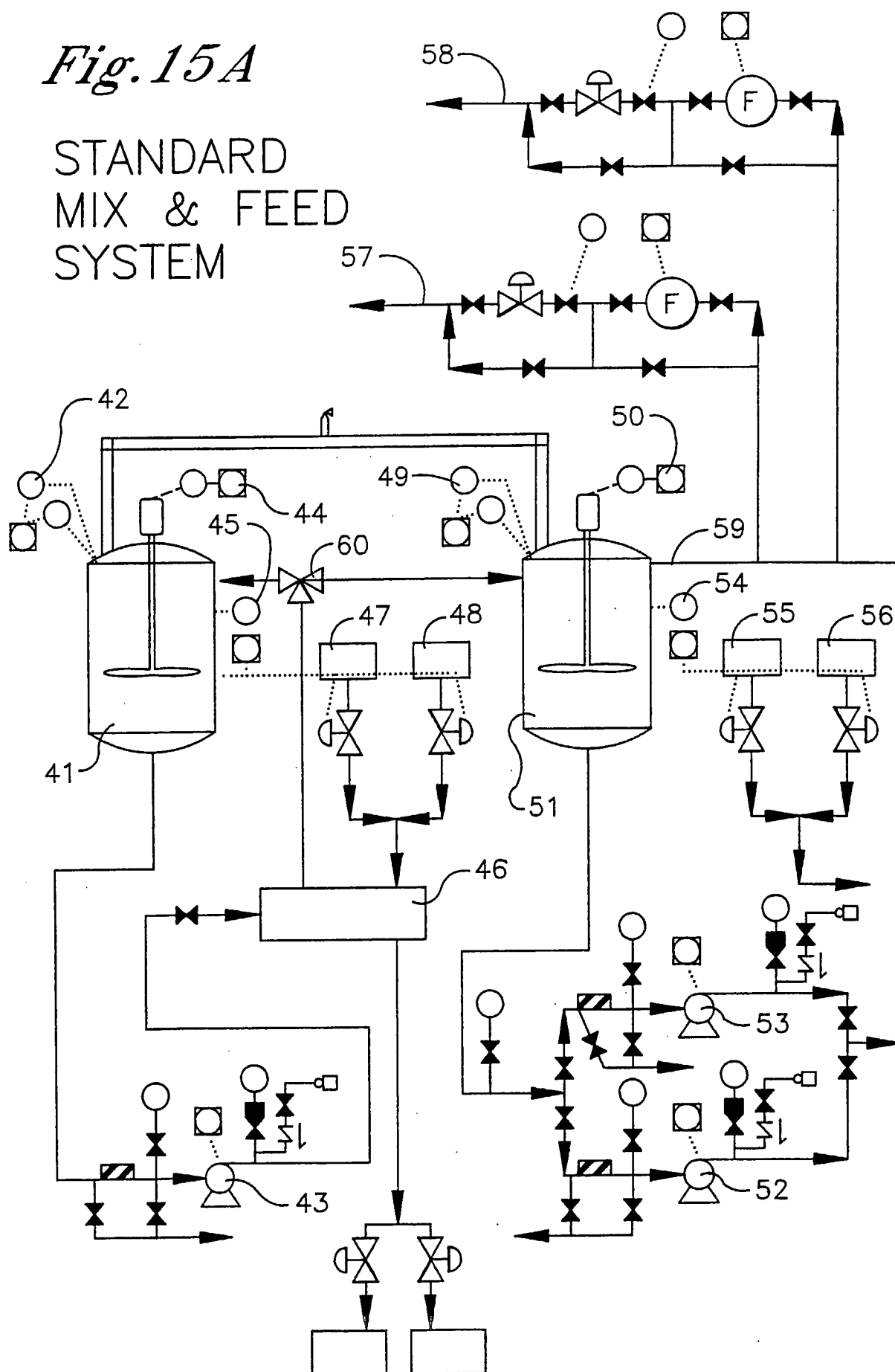
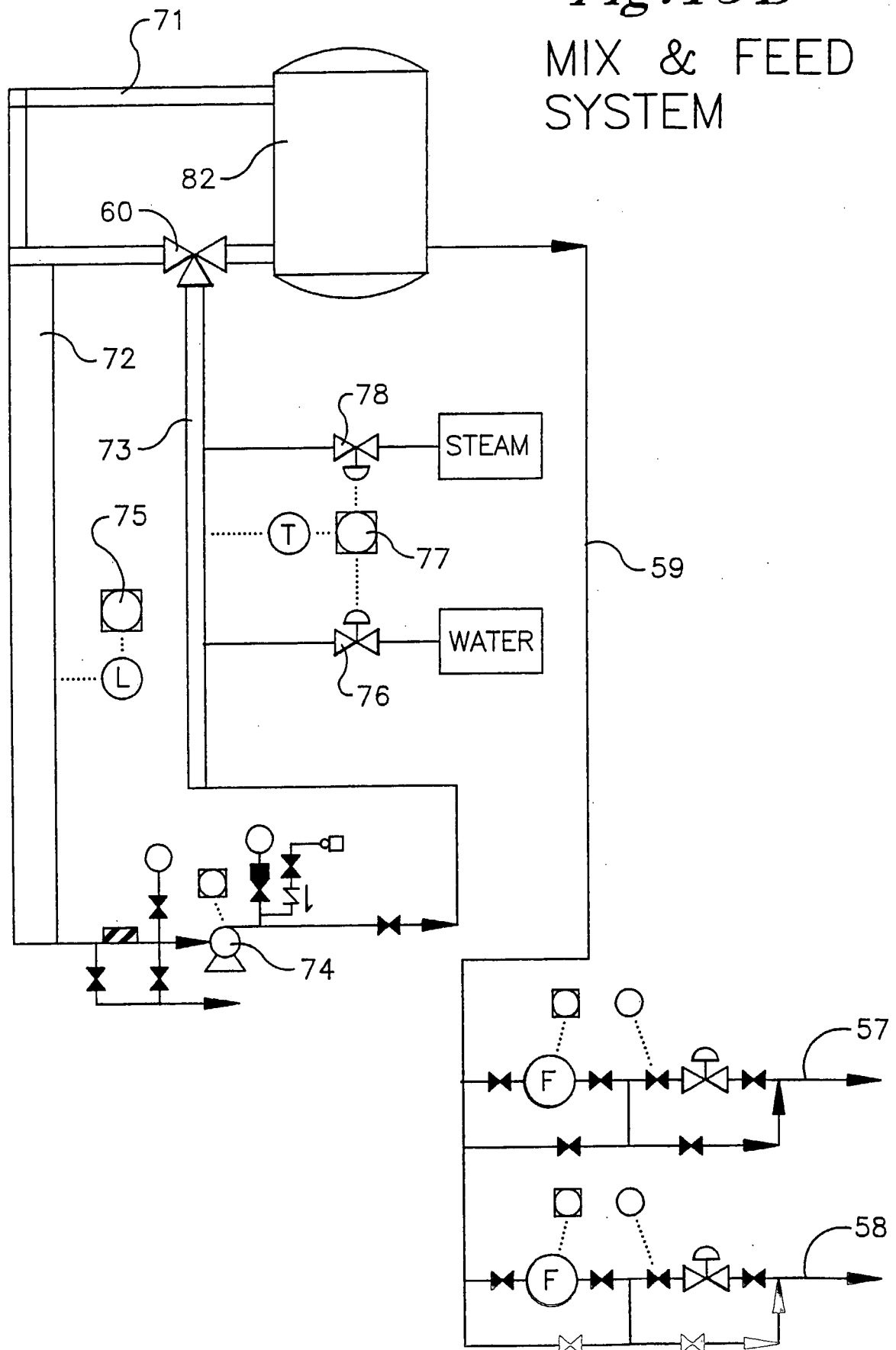
*Fig. 15A*STANDARD
MIX & FEED
SYSTEM

Fig. 15B
MIX & FEED
SYSTEM



ALTERNATING LOW AND HIGH PRESSURE CONFIGURATION:
ESTER EXCHANGE OR POLYCONDENSATION PIPE REACTOR

Fig. 16

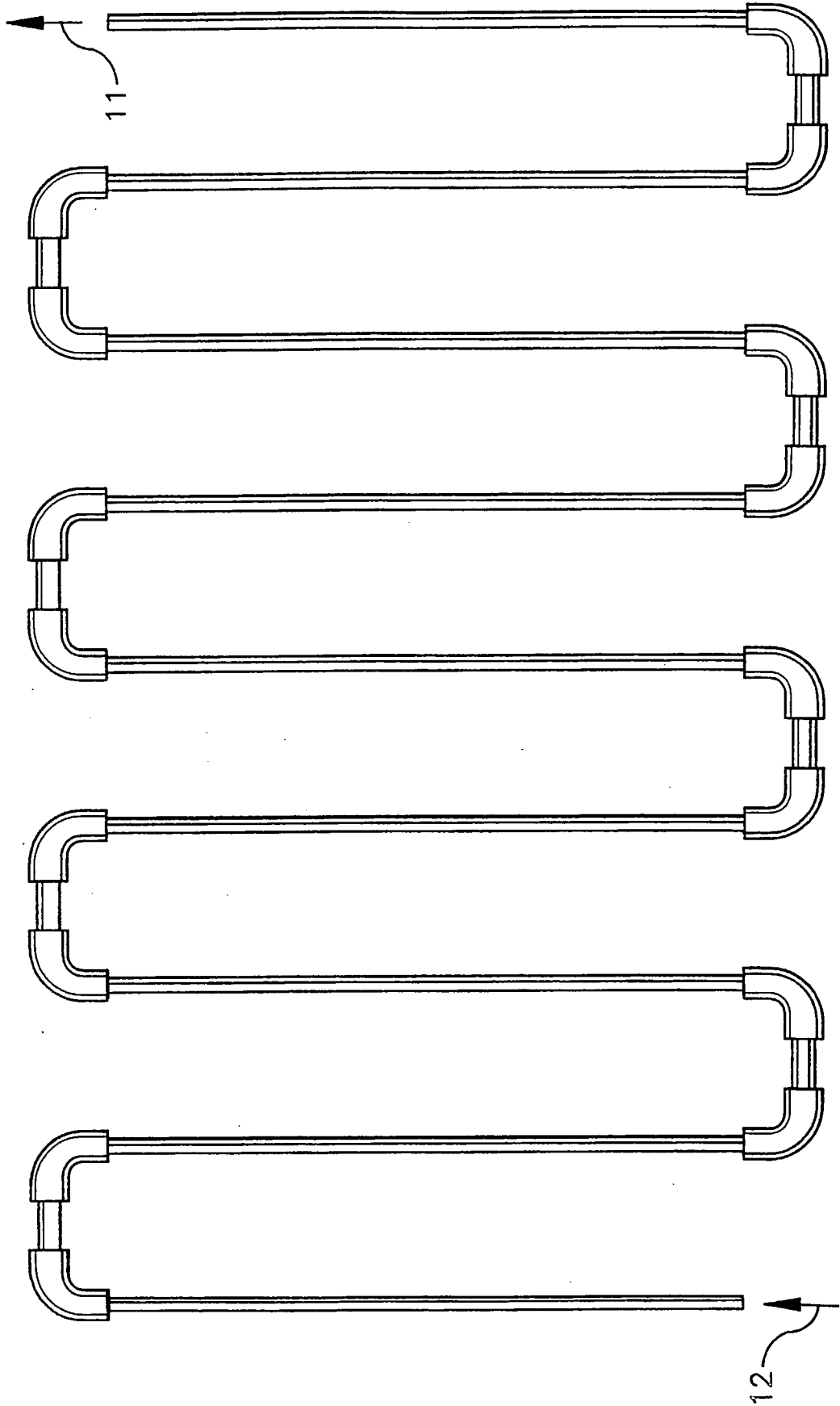
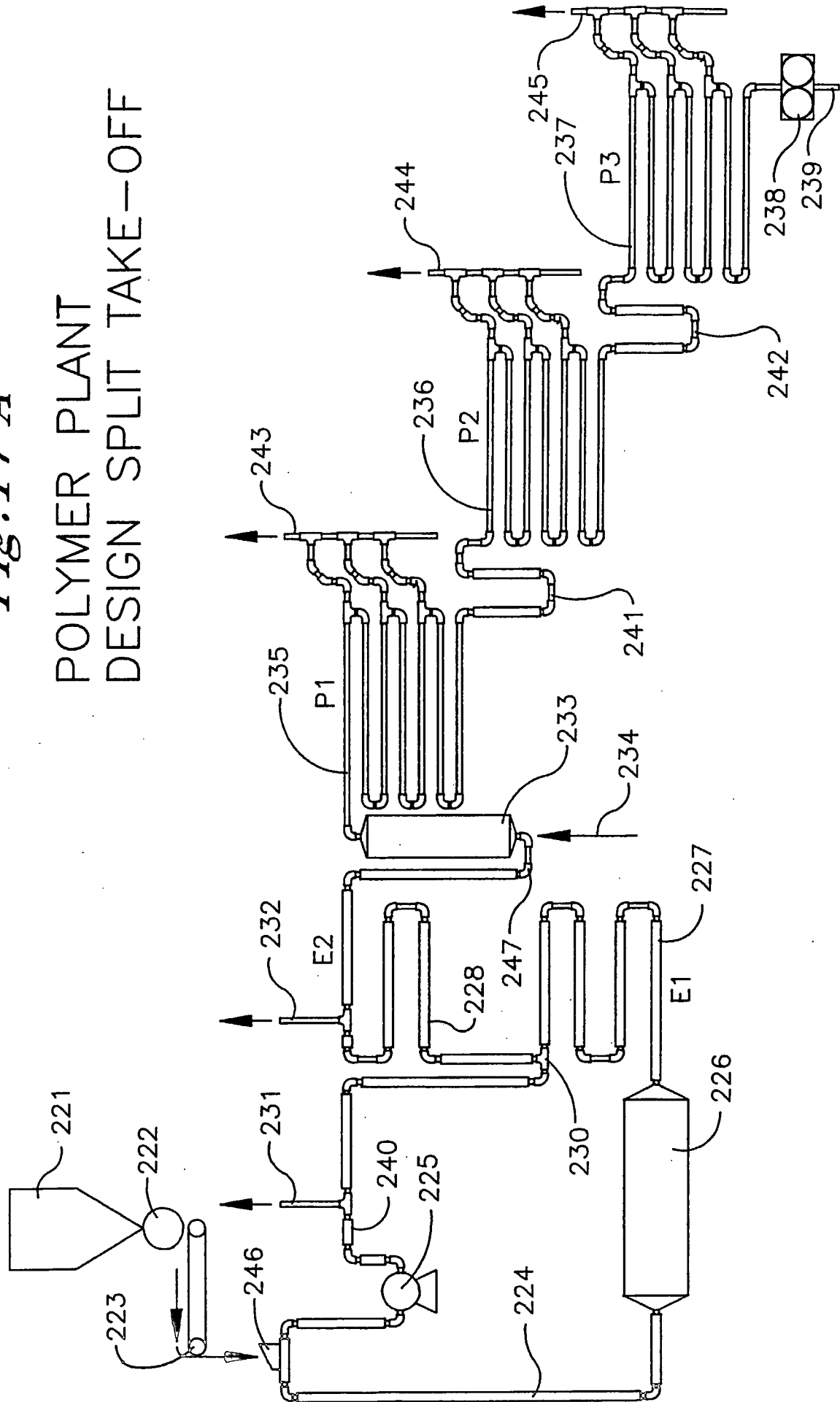


Fig. 17 A
POLYMER PLANT
DESIGN SPLIT TAKE-OFF



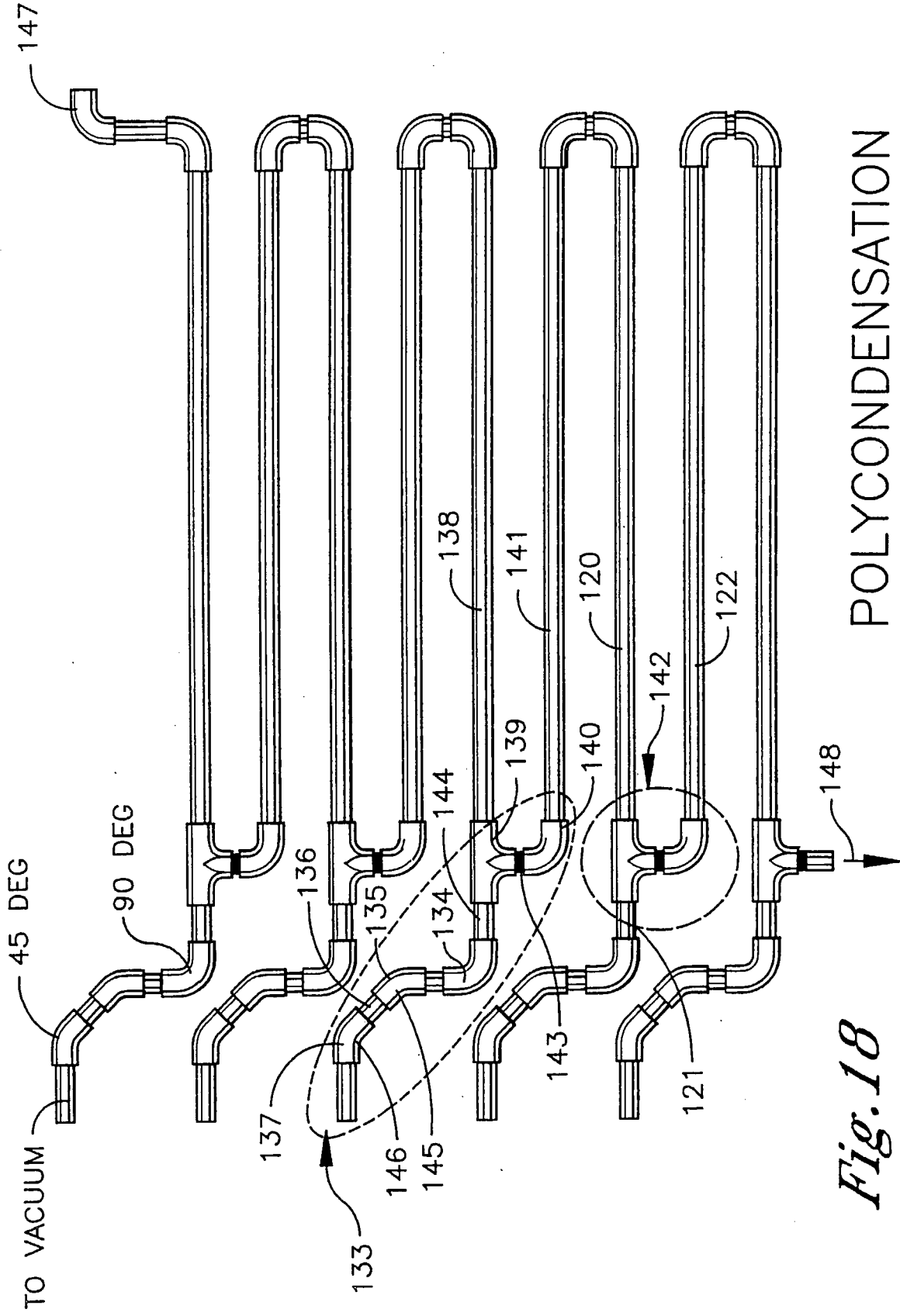


Fig. 18

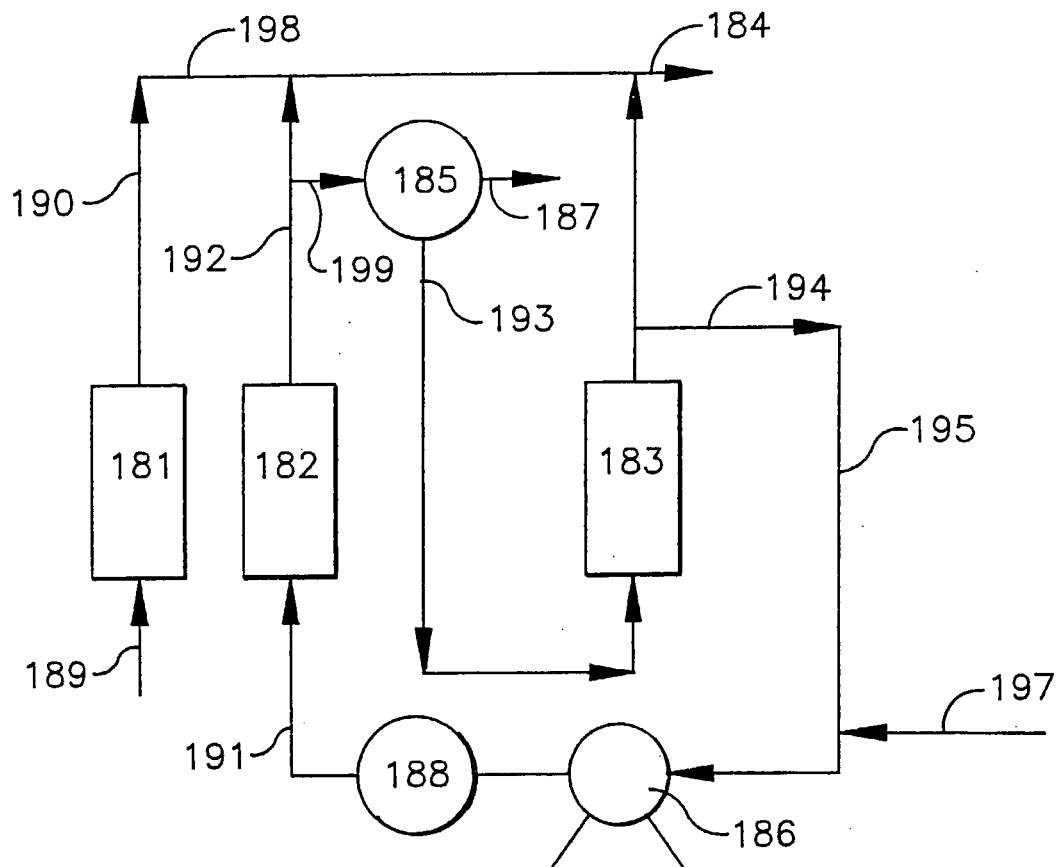
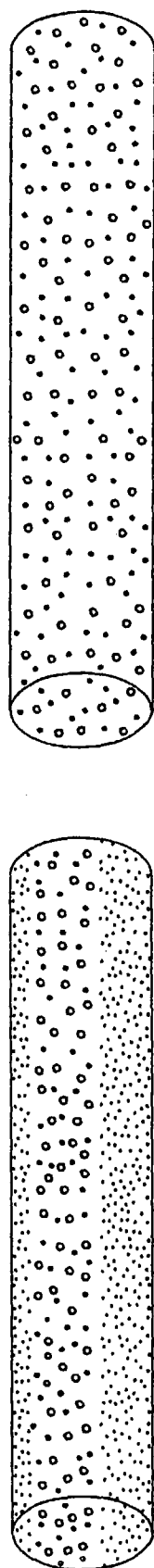


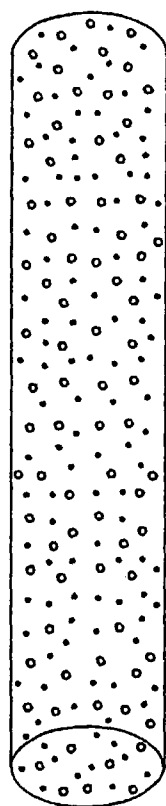
Fig. 19
REPLACING DISTILLATION
WITH ADSORPTION

Fig. 20A

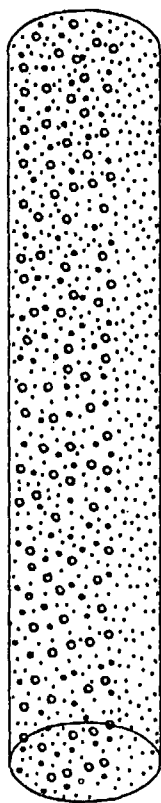
FLOW REGIMES OF TWO-PHASE FLOW IN HORIZONTAL PIPES



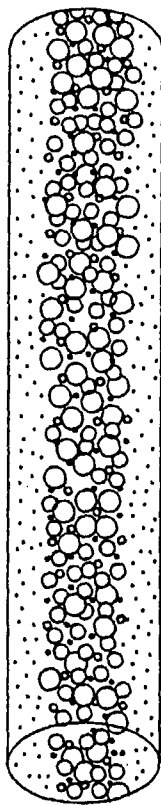
ANNULAR FLOW



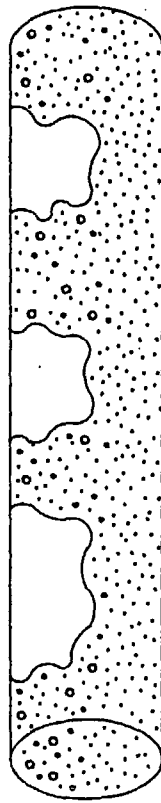
DISPERSED FLOW



BUBBLE FLOW



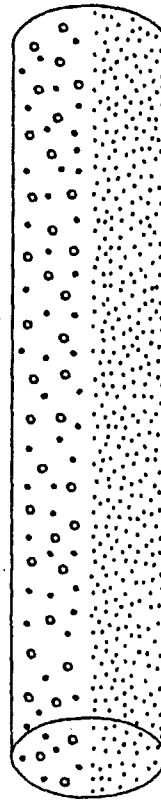
FROTH FLOW



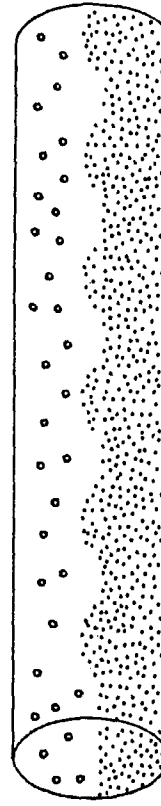
PLUG FLOW



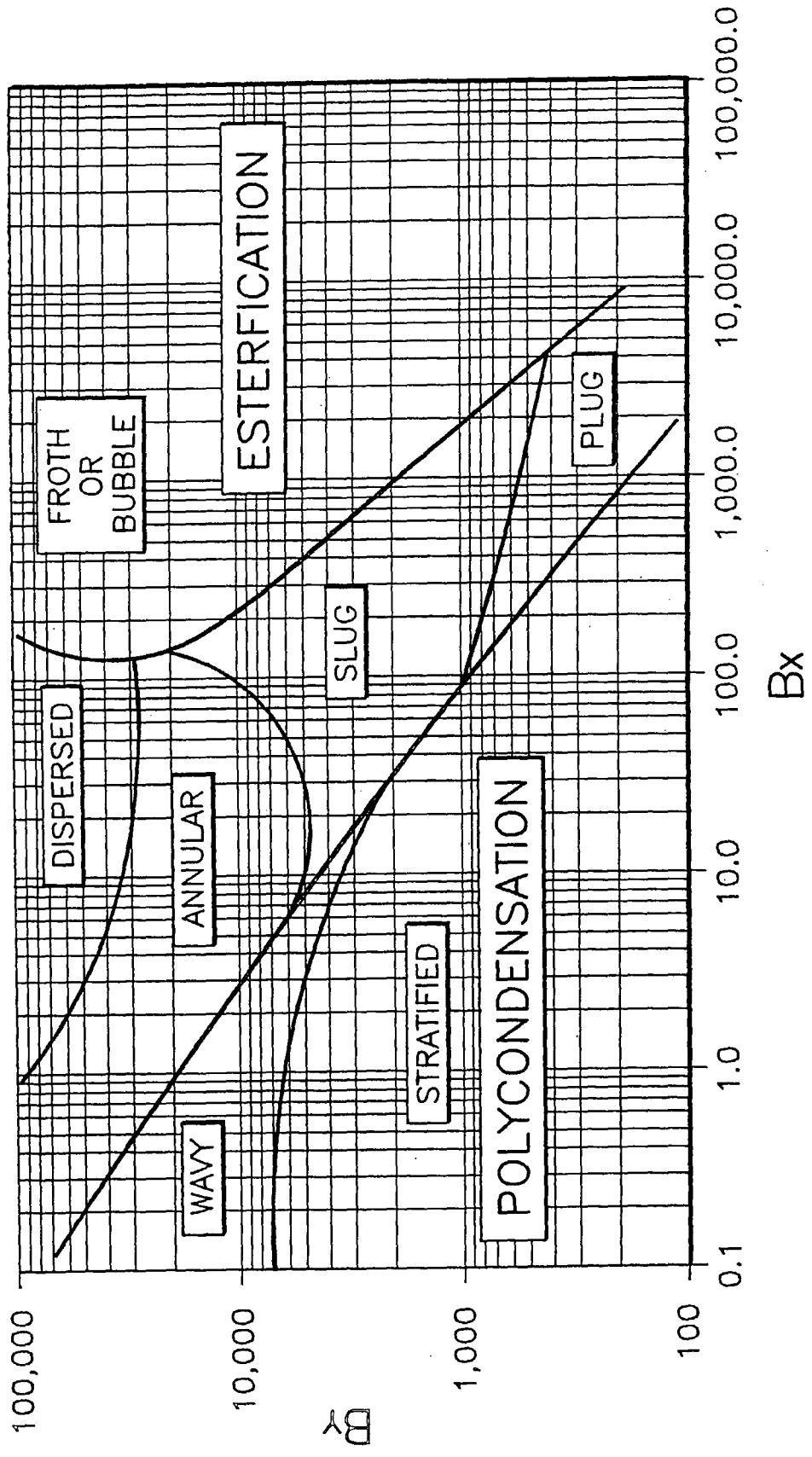
SLUG FLOW



STRATIFIED FLOW

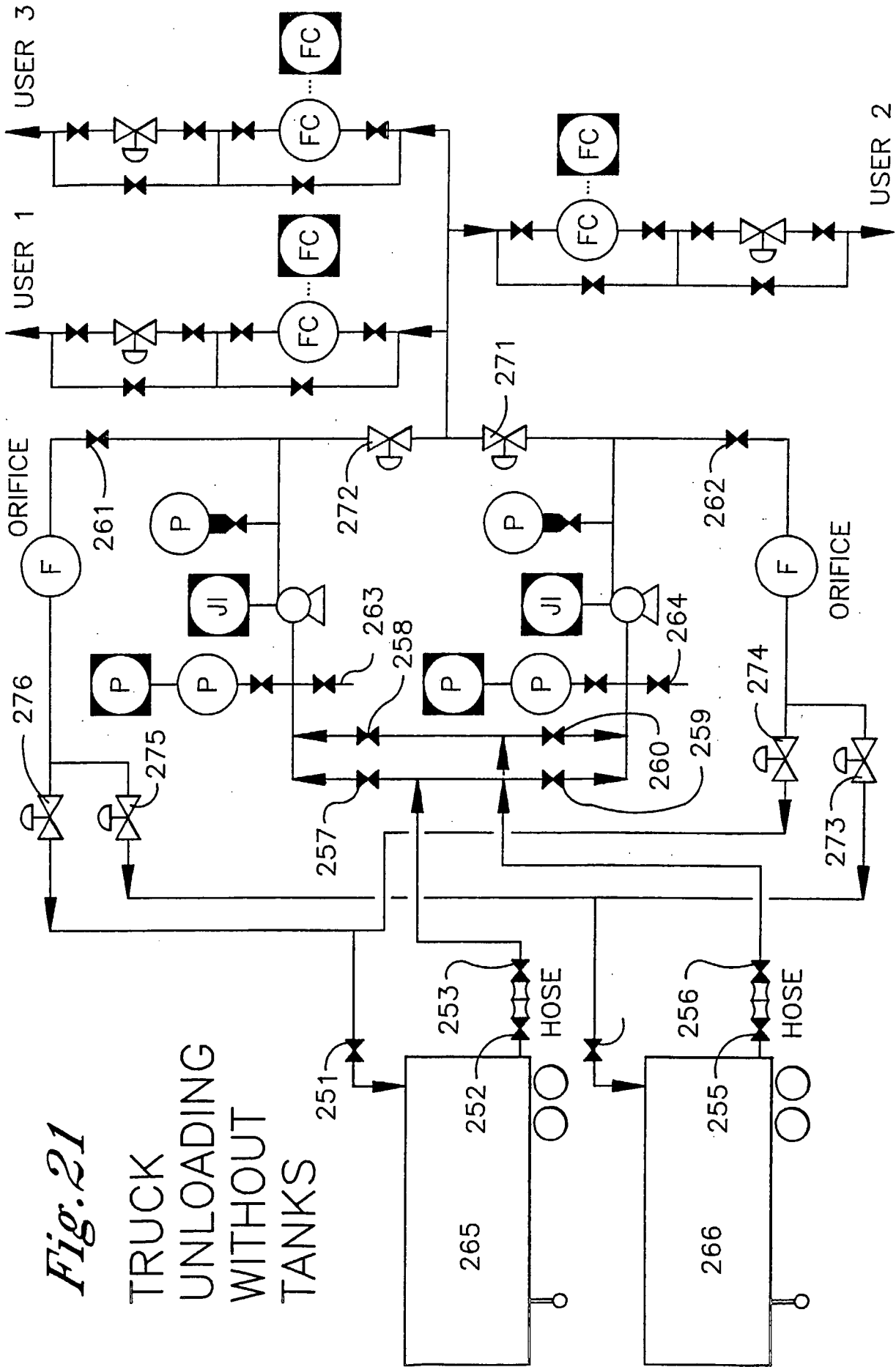


WAVY FLOW



TWO PHASE FLOW DIAGRAM

Fig. 20B



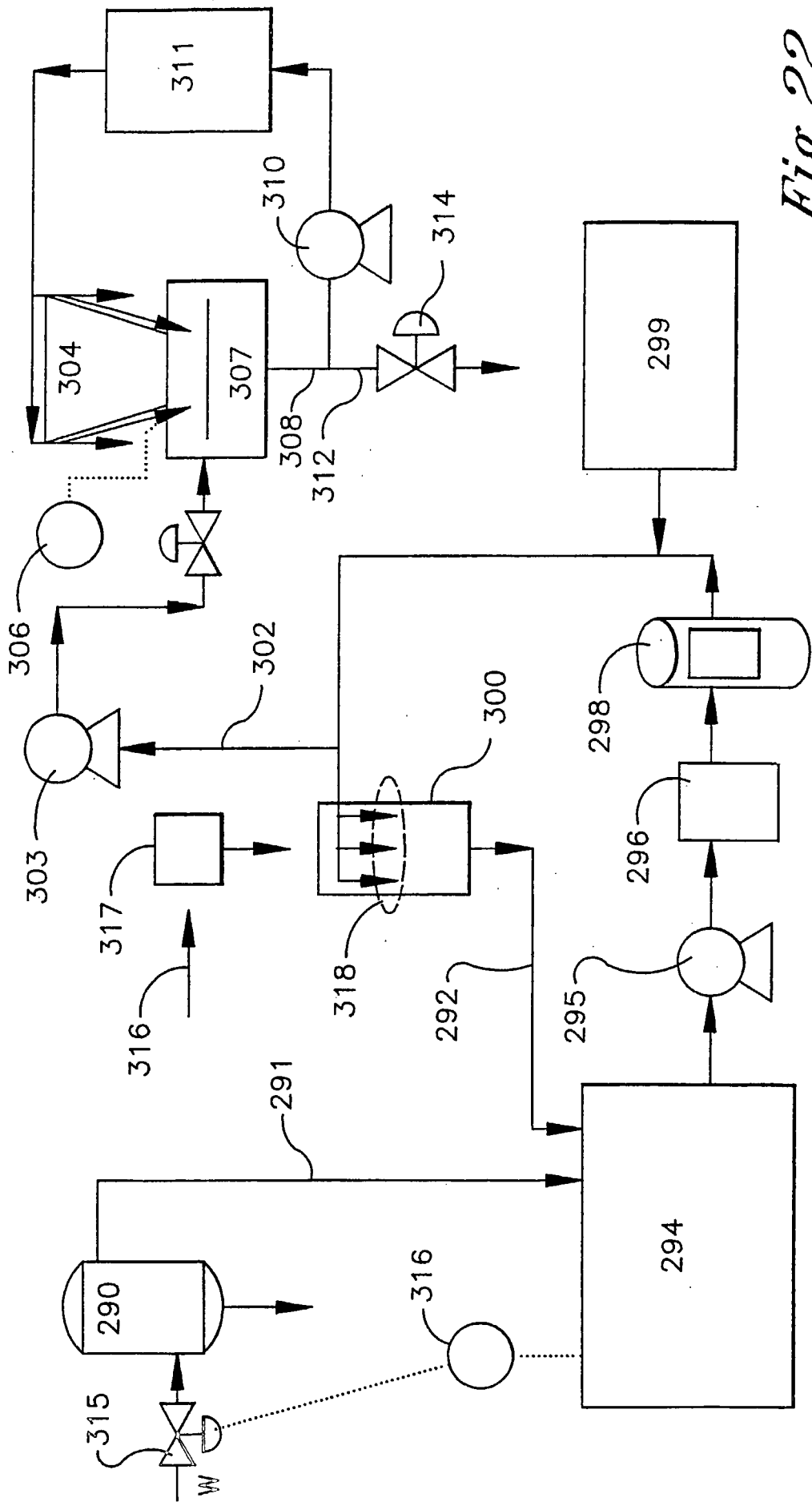


Fig. 22

COMBINING SAFETY SHOWER, COOLING TOWER,
CUTTER WATER, & HTM PUMP COOLERS

INTEGRATED VACUUM SYSTEM REDUCING EG JETS & ELIMINATING CHILLED WATER SYSTEM

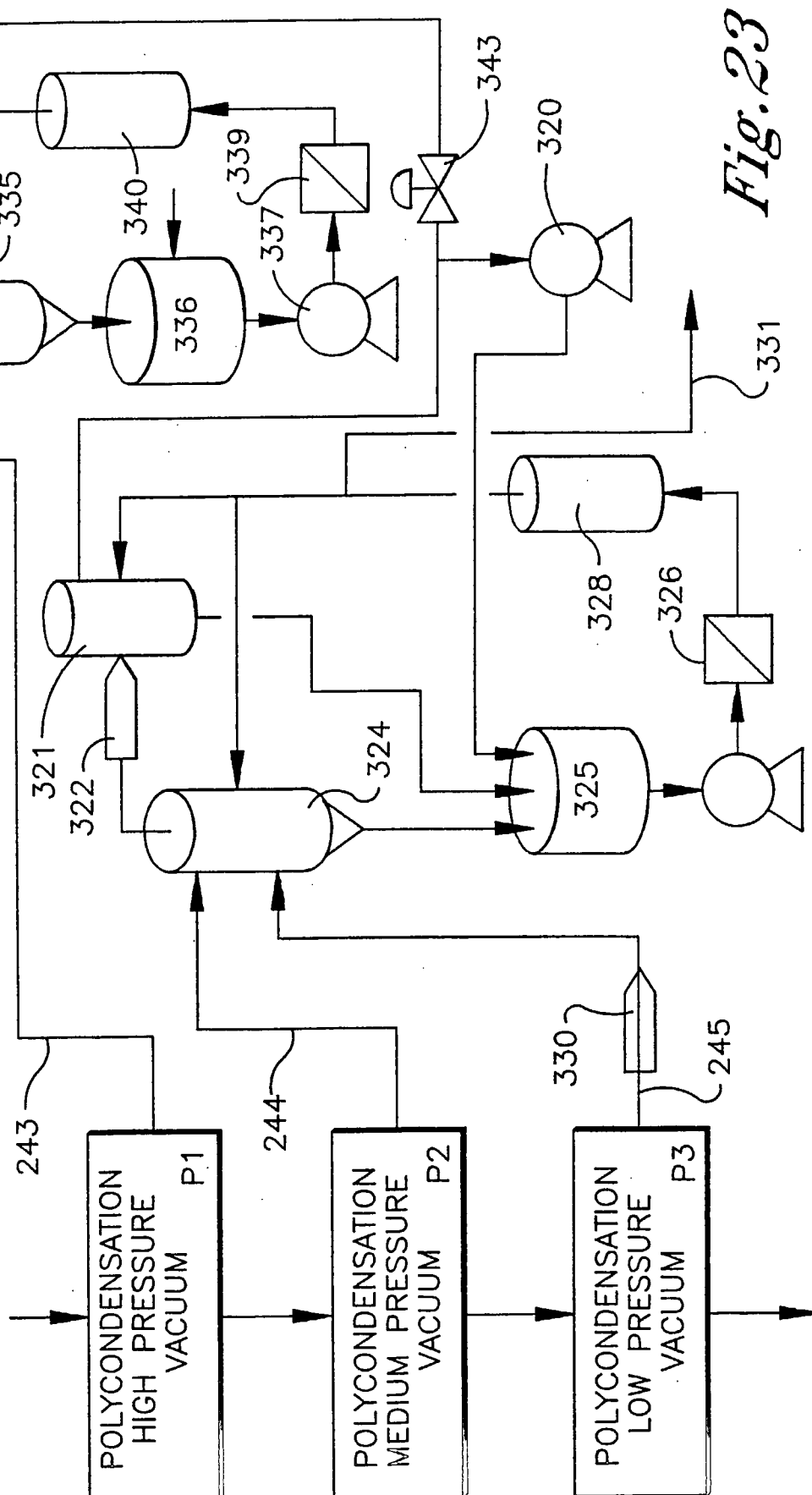
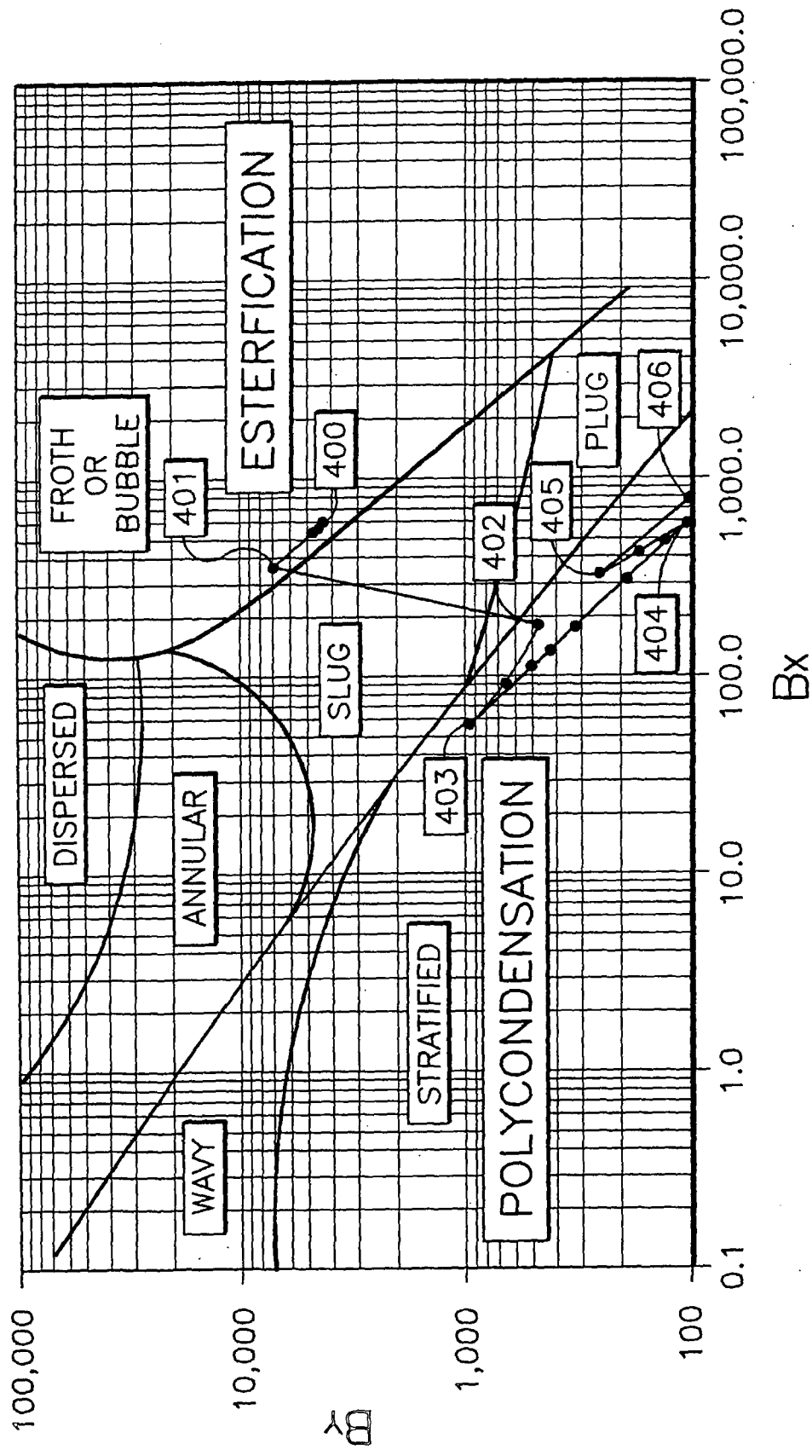


Fig. 23



PIPE REACTOR TWO-PHASE FLOW PATTERN

FIG.24