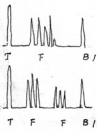
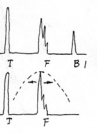


常见缺陷的波形特征

| 缺陷名称        | 波形特征   | 典型波形图  |
|-------------|--|--|
| 白点          | <p>缺陷波为林状波，波峰清晰，尖锐有力，伪波出现位置与缺陷分布相对应，探头移动时伪波切换，变化不快，降低探伤灵敏度时，伪波下降较底波慢。白点对底波反射次数影响较大，底波1—2次甚至消失。提高灵敏度时，底波次数无明显增加。圆周各处探伤波形均相类似。纵向探伤时，伪波不会延续到锻坯的端头。</p>  |   |
| 内<br>裂<br>纹 | <p>轴类工件中的横向内裂纹直探头探伤，声束平行于裂纹时，既无底波又无伤波，提高灵敏度后出现一系列小伤波；当探头从裂纹处移开，则底波多次反射恢复正常。斜探头轴向移动探伤和直探头纵向贯穿入射，都出现典型的裂纹波形即波形反射强烈，波底较宽，波峰分枝，成束状。斜探头移向裂纹时伪波向始波移动，反</p> |  |

(a)

自点缺陷



低倍



波形



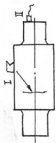
(b) 裂纹

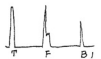
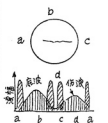
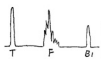





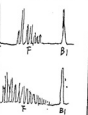
低倍



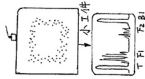
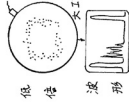
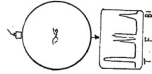
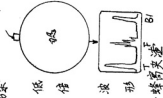
波形



| 缺陷名称 | 波形特征  | 典型波形图   |
|------|---|---|
|      | 之, 向远离始波方向移动。   |   |
|      | <p>中心锻造裂纹</p> <p>伤波为心部的强脉冲, 圆周方向移动探头时伤波幅度变化较大, 时强时弱, 底波次数很少或者底波消失。</p>  |    |
|      | <p>纵向内裂纹</p> <p>轴类工件中的纵向内裂, 直探头圆周扫伤, 声束平行于裂纹时, 既无底波也无伤波, 当探头转动<math>90^\circ</math>时 反射波最强, 呈现裂纹波形, 有时会出现裂纹的二次反射, 一般无底波。底波与伤波出现特殊的变化规律(右图)。</p> |    |
| 缩孔   | <p>伤波反射强烈, 波底宽大, 成束状。在主伤波附近常伴有小伤波, 对底波影响严重, 常使底波消失; 圆周各处伤波基本类似。缩孔常出现在冒口端或热节处。</p>   |  |

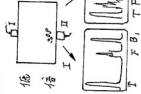
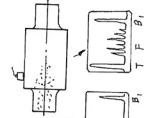
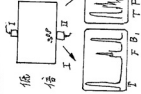
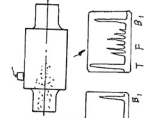
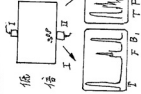
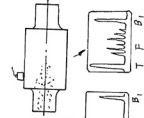
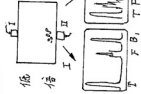
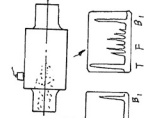
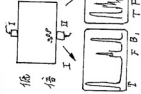
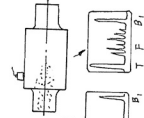
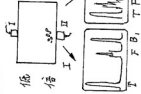
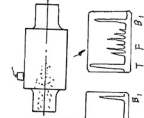
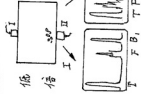
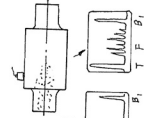
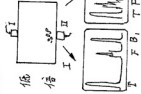
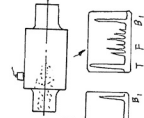
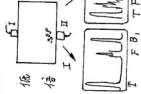
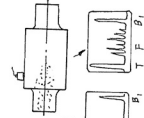
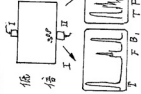
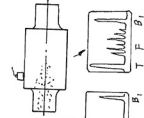
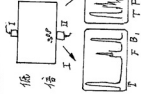
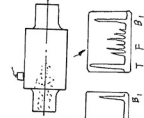
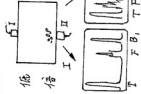
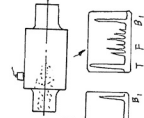
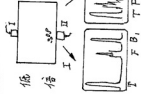
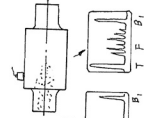
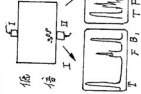
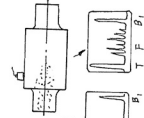
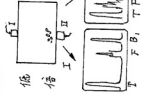
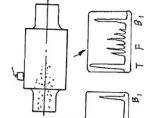
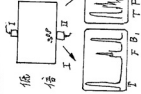
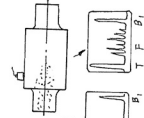
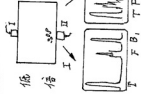
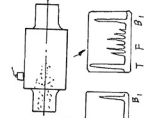
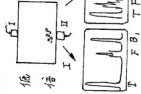
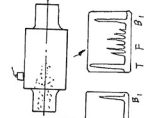
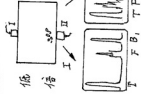
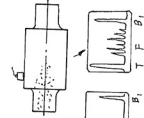
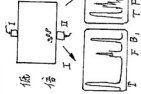
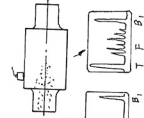
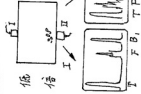
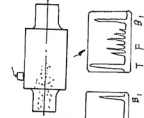
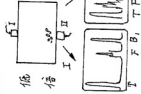
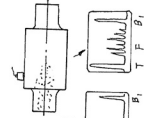
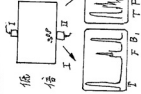
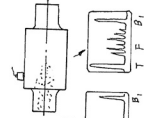
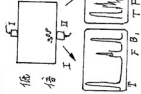
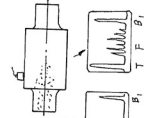
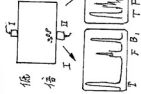
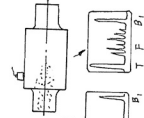
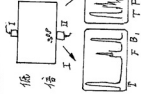
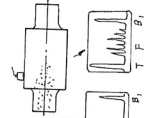
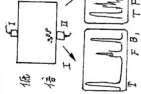
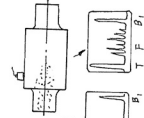
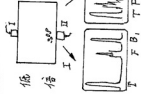
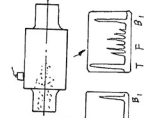
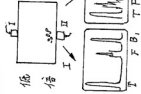
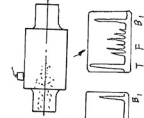
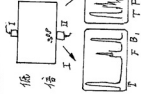
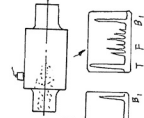
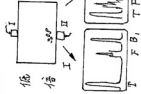
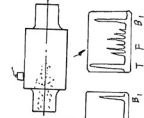
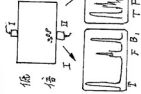
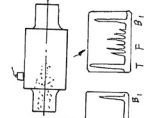
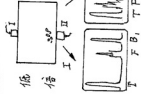
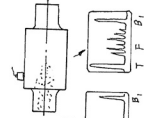
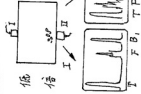
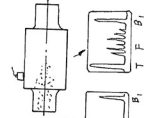
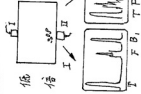
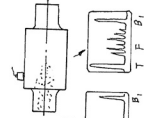
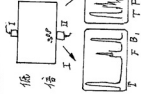
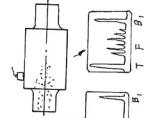
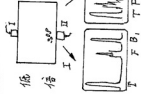
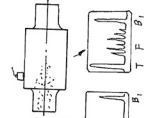
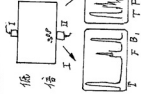
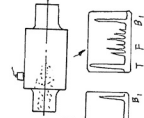
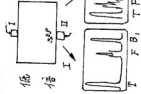
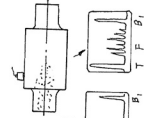
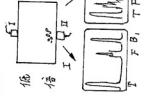
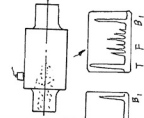
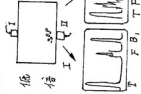
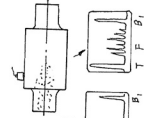
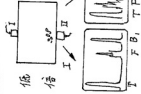
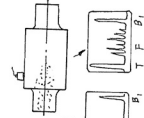
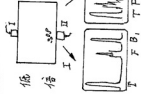
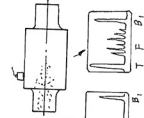
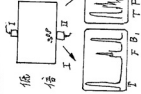
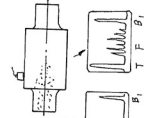
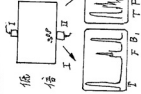
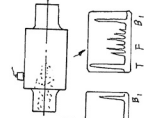
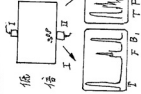
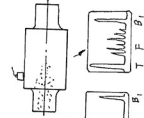
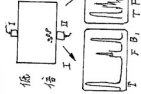
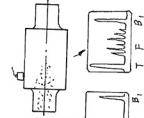
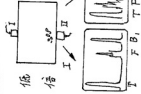
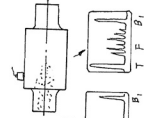
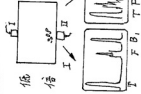
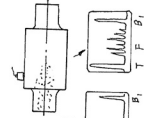
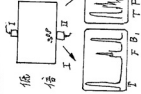
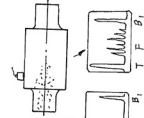
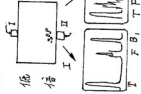
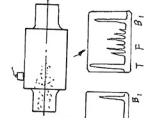
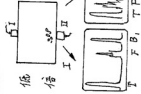
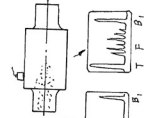
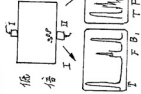
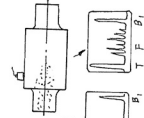
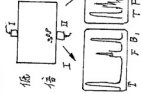
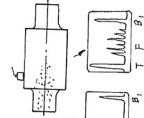
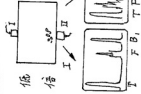
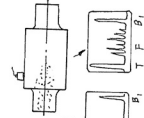
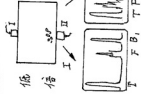
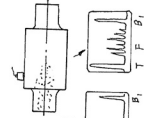
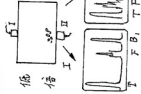
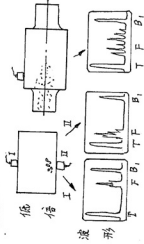
| 缺陷名称 | 波形特征   | 典型波形图   |
|------|--|---|
| 缩孔残余 | <p>伤波幅度强，出现在工件心部，沿轴向探测时伤波具有连续性，由于缩孔锻造变形，圆周各处伤波幅度差别较大，缺陷使底波严重衰减，甚至消失。</p>                         |    |
| 夹杂物  | <p>单个夹渣伤波为单一脉冲或带有小伤波的单个脉冲，波峰圆钝不清晰，伤波幅度虽高，但对底波及其反射次数影响不大。</p>                                     |    |
|      | <p>分散性夹杂物，伤波为多个，有时呈现林状波，但波顶圆钝不清晰，波形分枝，伤波较高，但对底波及底波多次反射次数影响较小。移动探头时，伤波变化比白点为快。</p>                |    |
| 疏松   | <p>锻件中较疏松，在低灵敏度时伤波很微弱或无伤波，提高灵敏度后才呈现典型的疏松波形，中心疏松多出现心部，一般疏松出现始波与底波之间。疏松对底波有一定影响但影响不大，随着灵敏度提高，底</p> |  |

(c) 缩孔残余

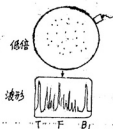


(d) 键型偏析 (高灵敏度)

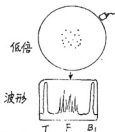
(e) 夹渣



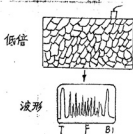
(g) 一般疏松 (高灵敏度)






(h) 中心疏松 (高灵敏度)



(i) 晶粒粗大 (高灵敏度)



| 缺陷名称 | 波形特征  | 典型波形图   |
|------|---|---|
| 疏松   | 波次数有明显增加。铸件中的疏松对声波有显著的吸收和散射作用，常使底波显著减少，甚至使底波消失，严重的疏松既无底波又无伤波，探头移动时会出现波峰很低的蠕动波形。           |    |
| 偏析   | 锭型偏析在通常探伤灵敏度常常无伤波，提高灵敏度后才有环状分布的伤波出现，它对底波反射次数无明显影响，随着探伤灵敏度提高，底波次数明显增加。                     |    |
|      | 点状偏析的声学反射特性较好，波形界于草状波与环状波之间，伤波出现位置与偏析点的分布有关。  |   |
| 晶粒粗大 | 晶粒粗大的波形是典型草状波伤波丛集，如密生草状，伤波模糊不清晰，波与波之间难于分辨，移动探头时伤波跳动迟滞，通常探伤灵敏度，底波次数很少，一般1~2次，无伤波，提高灵敏度后底波次 |  |

| 缺陷名称 | 波形特征   | 典型波形图 |
|------|--|-------|
| 晶粒粗大 | 波数无明显增多，在一次底波前出现草状波，改变低频率探伤，底波次数明显增多或恢复正常，一般不再出现草状波。 |       |

板状（或两面平行的块状）工件，超声波（纵波）探伤时的多次反射底波是均匀的按指数曲线递减的多次脉冲波。

只有当探头移动到工件边缘时，由于工件不光滑和超声波打到侧面而产生迟到回波。



板状工件多次反射波形