Example 4.2 To see that the liveness problem can not be solved by the coverability tree, consider the two different Petri nets shown in Fig. 4.2(a) and 4.2(b). It is easy to verify that the two nets have the same coverability tree shown in Fig. 4.3(a). Yet, the net shown in Fig. 4.2(a) is a live Petri net while the net shown in Fig. 4.2(b) is not live, since no transitions are enabled after firing t_1, t_2 and t_3.

The *coverability graph* of a Petri net (N, M_0) is a labeled directed graph $G = (V, E)$. Its node set V is the set of all distinct labeled nodes in the coverability tree, and the arc set E is the set of arcs labeled with single transition t_k representing all possible single transition firings such that $M_i[t_k>M_j$, where M_i and M_j are in V.

Example 4.3 Fig. 4.3(b) shows the coverability graph for the two nets shown in Fig. 4.2(a) and (b).

For a bounded Petri net, the coverability graph is referred to as the *reachability graph*, because the vertex set V becomes the same as the reachability set, $R(M_0)$. An application of reachability graphs will be discussed in Chapter 9.

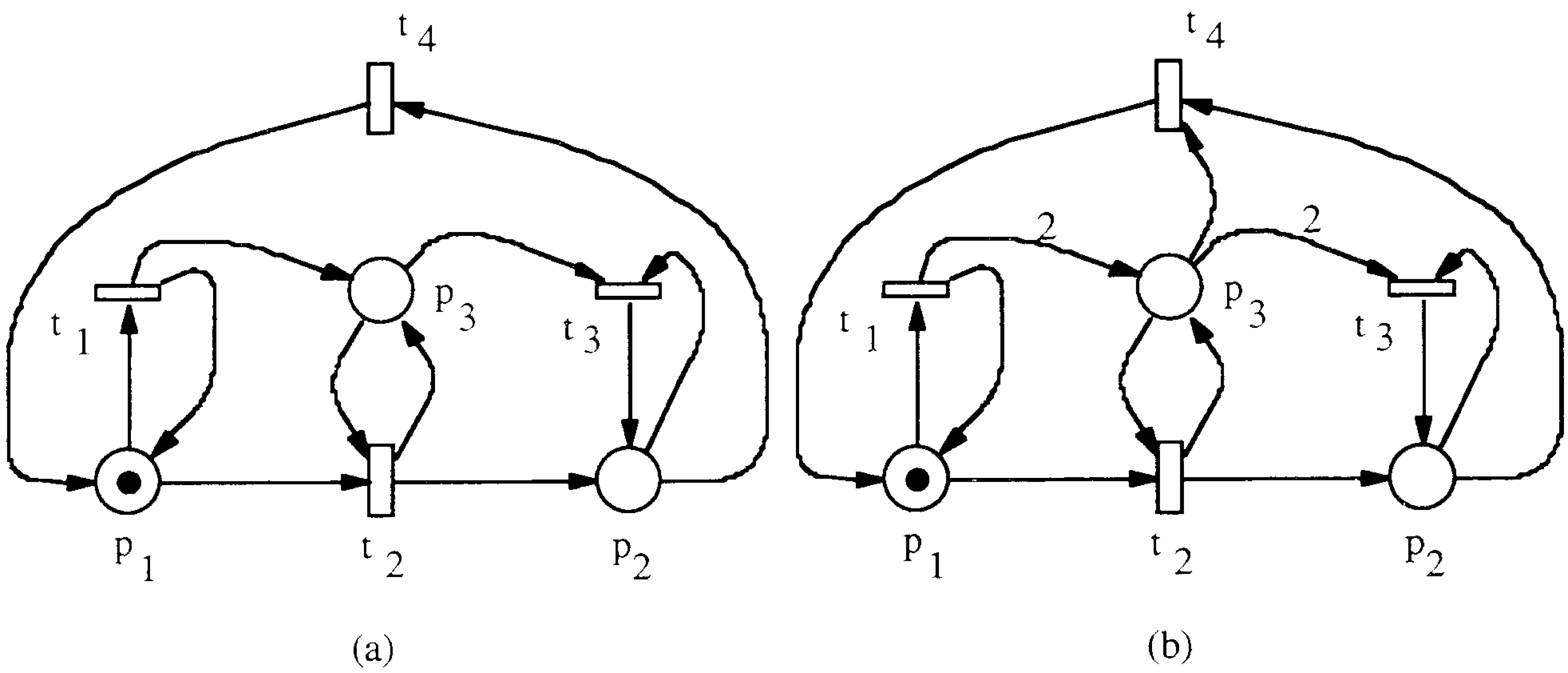

Fig. 4.2 Two Petri nets having the same coverability tree. (a) A live net. (b) A nonlive net.