```
module Manager
  type pair = (int index, double value);
  op getTask(result int row, len; result pair [*]elems);
  op putResult(int row, len; pair [*]elems);
body Manager
  int lengthA[n], lengthC[n];
  pair *elementsA[n], *elementsC[n];
  # matrix A is assumed to be initialized
  int nextRow = 0, tasksDone = 0;

  process manager {
    while (nextRow < n or tasksDone < n) {
      # more tasks to do or more results needed
      in getTask(row, len, elems) ->
          row = nextRow;
          len = lengthA[i];
          copy pairs in *elementsA[i] to elems;
          nextRow++;
      [] putResult(row, len, elems) ->
          lengthC[row] = len;
          copy pairs in elems to *elementsC[row];
          tasksDone++;
      ni
    }
  }
end Manager
```

Figure 9.1 (a) Sparse matrix multiplication: Manager process.