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EVENT: Start with the library "mlp" using the compiled version.

; pplinc3.bm is our 1st PIPELINE proof.

;;;; (Sugared) Circuits:
| #|
(setq A '(SY-A (x))
 (Y1 S Inc x)
 (Y2 S Inc Y1)
 (Y3 S Inc Y2)
 ; and the cork:
 (Yc2 R 2 Y3)
 (Yc1 R 1 Yc2)
(setq B '(SY-B (x))
 (Z1 S Inc x)
 (Z2 R 0 Z1)
 (Z3 S Inc Z2)
 (Z4 R 0 Z3)
 (Z5 S Inc Z4)
 (Zout R 0 Z5)
 ))

(setq pplinc3 ' ( |#
 ; BM DEFINITIONS and A2 LEMMAS, generated by BMSYSD:
 ; comb_inc.bm: INCrement combinational element
 ; U7-DONE

DEFINITION: inc(u) = (1 + u)

; Everything below generated by: (bmcomb 'inc '() '(x))

DEFINITION:
 s-inc(x)
 = if empty(x) then E
   else a (s-inc(p(x)), inc(l(x))) endif

;; A2-Begin-S-INC

THEOREM: a2-empty-s-inc
empty (s-inc(x)) = empty(x)

THEOREM: a2-e-s-inc
(s-inc(x) = E) = empty(x)

THEOREM: a2-lp-s-inc
len (s-inc(x)) = len(x)

THEOREM: a2-lpe-s-inc
eqlen (s-inc(x), x)

THEOREM: a2-ic-s-inc
s-inc (i (c_x, x)) = i (inc (c_x), s-inc (x))
Theorem: a2-lc-s-inc
(¬empty(x)) → (l(s-inc(x)) = inc(l(x)))

Theorem: a2-pc-s-inc
p(s-inc(x)) = s-inc(p(x))

Theorem: a2-hec-s-inc
(¬empty(x)) → (h(s-inc(x)) = inc(h(x)))

Theorem: a2-bc-s-inc
b(s-inc(x)) = s-inc(b(x))

Theorem: a2-bnc-s-inc
bn(n, s-inc(x)) = s-inc(bn(n, x))

;; A2-End-S-INC

; eof:comb_inc.bm

Definition:
topor-sy-a(ln)
= if ln = 'y1 then 1
  elseif ln = 'y2 then 2
  elseif ln = 'y3 then 3
  elseif ln = 'yc2 then 0
  elseif ln = 'yc1 then 0
  elseif ln = 'yout then 0
  else 0 endif

Definition:
sy-a(ln, x)
= if ln = 'y1 then s-inc(x)
  elseif ln = 'y2 then s-inc(sy-a('y1, x))
  elseif ln = 'y3 then s-inc(sy-a('y2, x))
  elseif ln = 'yc2
    then if empty(x) then E
      else i(2, sy-a('y3, p(x))) endif
  else ln = 'yc1
    then if empty(x) then E
      else i(1, sy-a('yc2, p(x))) endif
  else ln = 'yout
    then if empty(x) then E
      else i(0, sy-a('yc1, p(x))) endif
  else sfix(x) endif
Theorem: a2-empty-sy-a
empty (sy-a (ln, x)) = empty (x)

Theorem: a2-e-sy-a
(sy-a (ln, x) = e) = empty (x)

Theorem: a2-lp-sy-a
len (sy-a (ln, x)) = len (x)

Theorem: a2-lpe-sy-a
eqlen (sy-a (ln, x), x)

Theorem: a2-pe-sy-a
p (sy-a (ln, x)) = sy-a (ln, p (x))

Definition:
topor-sy-b (ln)
= if ln = 'z1 then 1
  elseif ln = 'z2 then 0
  elseif ln = 'z3 then 1
  elseif ln = 'z4 then 0
  elseif ln = 'z5 then 1
  elseif ln = 'zout then 0
  else 0 endif

Definition:
sy-b (ln, x)
= if ln = 'z1 then s-inc (x)
  elseif ln = 'z2 then if empty (x) then E
    else i (0, sy-b ('z1, p (x))) endif
  elseif ln = 'z3 then s-inc (sy-b ('z2, x))
  elseif ln = 'z4 then if empty (x) then E
    else i (0, sy-b ('z3, p (x))) endif
  elseif ln = 'z5 then s-inc (sy-b ('z4, x))
  elseif ln = 'zout then if empty (x) then E
    else i (0, sy-b ('z5, p (x))) endif
  else sfix (x) endif
;;; A2-Begin-SY-B

THEOREM: a2-empty-sy-b
empty (sy-b (ln, x)) = empty (x)

THEOREM: a2-e-sy-b
(sy-b (ln, x) = E) = empty (x)

THEOREM: a2-lp-sy-b
len (sy-b (ln, x)) = len (x)

THEOREM: a2-lpe-sy-b
eqlen (sy-b (ln, x), x)

THEOREM: a2-pc-sy-b
p (sy-b (ln, x)) = sy-b (ln, p (x))

;;; A2-End-SY-B

;;; CORRECTNESS PROOF (hand generated, dreamer!):

; EQ-A-B: just like in CorrSL, since there are no loops, straight unfolding
; should work, as long as Brain's normalization is strong enough...
; Note about the hint:
;   - STR-add1-len-P2 (and hence LEN) came from CorrSL.
;   - at first we disabled S-INC thinking that it was irrelevent, but it
;     IS necessary, since it affects the value of the cork.

THEOREM: eq-a-b
sy-b ('zout, x) = sy-a ('yout, x)

; eof: pplinc3_bm
;})
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