BFO 2020 Material Entity Axioms

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Member part of and has member part are inverse relations [jrm-1]
    \forall t,a,b (memberPartOf(a,b,t) \leftrightarrow hasMemberPart(b,a,t))
Member part of is dissective on third argument, a temporal region [yip-1]
    \forall p,q,r,s (memberPartOf(p,q,r) \land temporalPartOf(s,r) \rightarrow memberPartOf(p,q,s))
An object aggregate always has at least one member [uhs-1]
    ∀ag,t (instanceOf(ag,objectAggregate,t)
           \rightarrow \exists o1 (instanceOf(o1,object,t) \land memberPartOf(o1,ag,t)))
Member part of is time indexed and has domain: object and range: object aggregate [dvq-1]
    \forall a,b,t (memberPartOf(a,b,t))
            \rightarrow instanceOf(a,object,t) \land instanceOf(b,objectAggregate,t)
             \land instanceOf(t,temporalRegion,t))
A fiat object part =def a proper part of an object [yir-1]
    ∀f,t (instanceOf(f,fiatObjectPart,t)
         \leftrightarrow \exists o (instanceOf(o,object,t) \land properContinuantPartOf(f,o,t)
               \land \neg instanceOf(f,immaterialEntity,t)))
I is an immaterial entity = Def. i is an independent continuant that has no material entities as parts. [udu-1]
    ∀i,t (instanceOf(i,immaterialEntity,t)
         \land \neg (\exists m (instanceOf(m,materialEntity,t) \land continuantPartOf(m,i,t))))
Any continuant that doesn't s depend or g depend on something is an independant continuant [ilw-1]
    \forall c1 (\existst instanceOf(c1,independentContinuant,t)
         \leftrightarrow \exists t instanceOf(c1,continuant,t)
          \land \neg (\exists c2, t (specifically Depends On(c1, c2) \lor generically Depends On(c1, c2, t))))
An object aggregate has more than one member at at least one time [ibd-1]
     \forall ag (\existst instanceOf(ag,objectAggregate,t)
          \rightarrow \exists o1,o2,t(o1\neqo2 \land instanceOf(o1,object,t) \land memberPartOf(o1,ag,t)
                      \land instanceOf(o2,object,t) \land memberPartOf(o2,ag,t)))
All parts of an aggregate overlap some member [fsy-1]
    \forallt,b,x (properContinuantPartOf(x,b,t) \land instanceOf(b,objectAggregate,t)
            \rightarrow \existso(memberPartOf(o,b,t)
                   \land (\exists z (continuantPartOf(z,x,t) \land continuantPartOf(z,o,t))))
If a material entity has a proper part, then at least one of its proper parts is not an immaterial entity [adm-1]
    \forall m,t (instanceOf(m,materialEntity,t) \land (\exists mp(continuantPartOf(mp,m,t) \land mp\neqm))
           \rightarrow \exists mp(mp \neq m \land continuantPartOf(mp,m,t) \land \neg instanceOf(mp,immaterialEntity,t)))
An object aggregate has member parts only disjoint objects [evk-1]
    \forallb,c,t (memberPartOf(b,c,t)
            \leftrightarrow instanceOf(b,object,t) \land instanceOf(c,objectAggregate,t)
            \land properContinuantPartOf(b,c,t)
             \land (\forall d (memberPartOf(d,c,t))
                         \rightarrowb=d\lor \neg(\exists z (continuantPartOf(z,b,t) \land continuantPartOf(z,d,t))))))
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Alan Ruttenberg, November 12, 2021. The most recent version of this file will always be in the GitHub repository https://github.com/bfo-ontology/bfo-2020

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