[0073] Referring to **FIG. 7***b*, an open state of valve **250** is shown in which TRS **256** has been essentially fully retracted into reservoir **255** to open passage **268**, thereby permitting passage of material through valve **250**. Because TRS **256** is essentially fully retracted into reservoir **255** rather than being dispersed in a downstream direction or left in passage **268**, abutting portions **276**, **277** can still exhibit an impression of projection **280**.

[0074] A minimum opening distance **292** from TRS **256** to outer wall **288** of projection **280** is sufficiently large to allow material to be passed through the passage at a desired material transport rate. Although **FIG. 7***b* shows valve **250** in a fully open state, it should be understood that valve **250** can be operated in a partially open state, in which third abutting portion **272** is intermediately disposed between a fully closed position abutting wall **270** and a fully opened position substantially aligned with a first channel wall **273**. As discussed above, an open state of valve **250** can be repeatedly repositioned between the opened and closed states without a significant loss of material **256** or capacity to prevent transport of material when closed.

[0075] A gate valve **250'**, seen in **FIGS. 8***a* and **8***b* operates to close the valve similarly to valve **250**. In opening a passage **268'**, valve **250'** operates similarly to valve **50'** in that a mass of TRS **256'** obstructing passage **268'** disperses or melts and enters a downstream channel, thereby opening the valve. The dispersal or melting preferably occurs upon actuation of a heat source **37** in thermal contact with TRS **256**.

[0076] Referring to **FIG. 9***a*, a valve **350** includes an opposed wall portion **374** that does not extend into a material transport path **360** of a first channel **352**. In the closed state, a mass of thermally responsive substance **356** obstructs a passage **368**. A first abutting portion **376** of TRS **356** abuts first opposed wall portion **374**. Excess upstream pressure present at a first surface **376** of TRS **356** urges first abutting portion **376** against first opposed wall portion **374**, thereby closing valve **350** more securely.

[0077] Valve **350** preferably includes a second opposed wall portion **386** that also does not extend into material transport path **360**. First and second opposed wall portions **374**, **386** oppose one another so that valve **350** operates as a two-way valve. Thus, excess upstream pressure present at a second surface **378** of TRS **356** urges a second abutting portion **377** of TRS **356** against second opposed wall portion **386**.

[0078] In the open state, **FIG. 9***b*, valve **350** TRS **356** is retracted into reservoir **355**, thereby opening passage **368** to the passage of material.

[0079] A gate valve **350'**, seen in **FIGS. 10***a* and **10***b* operates close similarly to valve **350**. In opening a passage **368'**, valve **350'** operates similarly to valve **50'** in that a mass of TRS **356'** obstructing passage **368** disperses or melts, thereby opening the valve. The dispersal or melting preferably occurs upon actuation of a heat source **37** in thermal contact with TRS **356'**. Preferably, substantially all of TRS **356'** enters second channel **354**, downstream from valve **350'**.

[0080] Referring to **FIGS. 11***a*-**11***d* an embodiment of a valve **450** having a surface **500** configured to provide capillary assisted loading is shown. Valve **450** defines a passage **468** between first and second channels **452**, **454**. A temperature responsive substance, which, for clarity, is not shown in **FIGS. 11***a*-**11***c*, operates to open and close the valve, as discussed above. In one embodiment, for example, the opening of valve **450** comprises a retraction motion of TRS **456** into a reservoir **455**. In the preferred embodiment, the opening of passage **468** comprises a dispersing or melting of TRS **456**, which enters at least one downstream channel, thereby opening passage **468**.

[0081] Loading surface **500** is configured to limit the amount of TRS that enters channels **452**, **454** when TRS **456** is introduced into passage **468**. An opening **515** between passage **468** and first channel **452** defines a cross sectional area **516**, which is at least 40% smaller, preferably at least about 50% smaller, than an adjacent cross sectional area **518** within first channel **452**. Similarly, an opening **520** between passage **468** and second channel **454** preferably has a smaller cross sectional area than an adjacent cross sectional area within second channel **454**.

[0082] The reduced cross section of the passage openings is preferably achieved by reducing a height of the passage. As used herein, a height of a channel or passage refers to the smallest dimension of the channel or passage. For example, a distance **502** between loading surface **500** and an opposed surface **504** is less than corresponding distances **506** and **507** between opposed surfaces of first and second channels **452** and **454**, respectively. Distance **502** is at least about 40% preferably at least about 50%, and more preferably at least about 65% less than distances **506**, **507**.

[0083] To load TRS into passage **468**, a reservoir **455** and passage **468** are heated sufficiently to allow motion of the TRS therein. TRS is introduced through access port **40**. Capillary action draws TRS into passage **468**. Upon encountering first and second openings **510** and **512**, however, TRS in passage **468** encounters resistance, such as that caused by the surface tension of the TRS resisting the expansion of the surface area upon moving from the lower cross-sectional area opening into first and second channels **452**, **454**. Thus, as seen in **FIG. 11***d*, loading surface **500** allows the introduction of an amount of TRS that is sufficient to obstruct the passage of a valve but insufficient to enter adjacent channels **452** and **454**.

[0084] Valve **450** can include at least one opposed surface, such as opposed wall portion as described above, to prevent leakage in response to excess pressure present in either of channels when the valve is closed.

[0085] Referring to **FIGS. 12***a*-**12***c*, a valve **1001** has a loading surface **1000** that extends from a passage **1004** into a reservoir **1002**. For clarity, heat sources and TRS associated with valve **1001** are not shown in **FIG. 12***a*. Valve **1001** includes first and second channels **1006**, **1008** and a protrusion **1010**. Protrusion **1010** extends for a width w, into passage **1004** so that a width w_3 of the passage is less than a width w_2 of first and second channels **1006**, **1008**. Width w_3 is preferably from about 25% to about 75%, such as about 50% of width w_2. Width W_3 is preferably from about 25% to about 75%, such as about 50%, of a width w_4 of reservoir channel. The widths of first and second channels **1006**, **1008** are preferably, but not necessarily, the same. However, if one of the first or second channels is made wider, its height would have to be correspondingly reduced. The width w_4 of the reservoir can be wider or narrower than the width w_2 of the first and second channels.