VENEER SUPPORTED ORTHODONTIC APPLIANCE

FIELD OF THE INVENTION

This invention relates generally to orthodontics and to orthodontic appliances for attachment to the teeth of a patient and more particularly the invention is directed to an orthodontic appliance assembly that may be bonded to the enamel of a patient's tooth structure and may be connected to other orthodontic devices for application of forces to the teeth of the patient.

BACKGROUND OF THE INVENTION

Orthodontics is that branch of dentistry concerned with the study of the growth of craniofacial complex, the development of occlusion, and the treatment of dentofacial abnormalities. Orthodontic therapy is directed to abnormal occlusion of the teeth, growth of the complex of craniofacial bones and the function of the orofacial neuromusculature, which alone or in combination may cause any of a number of abnormalities such as impaired mastication, undesirable facial aesthetics, dysfunction of the temporomandibular articulation, susceptibility to periodontal disease, susceptibility to dental caries, and impaired speech due to the malpositions of the teeth etc. By means of suitable appliances, the individual teeth of the patient can be positioned more favorably to provide better aesthetics, occlusal function, oral health and speech.

Movement of teeth within the bone structure defined by the craniofacial skeletal structure of the patient may be accomplished in many different ways. One of the more typical means for accomplishing tooth movement is by employment of band and arch wire assemblies, wherein the teeth to be moved are encircled with bands of thin metal that is cemented to the teeth and dental appliances, which may take the form of arch wire brackets or any of numerous other connecting devices may be affized to or formed integrally with the band structure. An arch wire, which may be of round or rectangular configuration when viewed in cross section, may be received by the various brackets protruding from the bands encircling the teeth to be moved. Springs, elastic bands, and numerous other devices may be employed to apply forces to the various teeth to be moved within the rather porous craniofacial skeletal structure of the patient. As forces are applied to the teeth, during orthodontic therapy, the mechanical pressure applied between the teeth and the bone structure causes tooth drift, which, in simple terms, results from addition of bone structure on one side of the tooth and resorption on the opposite side. Orthodontic appliances are employed to produce a force that will elicit optimum tissue response within the periodontal ligament and bone structure of the patient thereby resulting in permanent repositioning of the patients teeth, as desired. The orthodontic appliance is a force system that stores and delivers forces against the teeth, muscles, or bone and creates a reaction within the periodontal ligament and alveolar bone that permits movements of the teeth relative to the bone structure, which movement is of permanent nature because it is accomplished by induced tooth drift that results in controlled reformation of the bone structure.

Orthodontic treatment often involves removal of at least some of the patient's teeth in order to gain the space that is necessary for optimum positioning of the

remaining teeth, but tooth removal is accomplished only when absolutely necessary to provide for optimum spacing. There are cases however, when the normal spacing of a patient's teeth is proper and tooth removal is inappropriate, but there is insufficient space to accommodate the combined thicknesses of the thin bands that normally encircle the teeth during treatment. Under this condition, removal of some of the patient's teeth may result simply to accommodate the bands that are necessary during treatment. Because of the undesirability of removing teeth simply to provide the space necessary for the orthodontic bands, it is considered desirable to provide means other than bands for support of the brackets and other orthodontic appliances that are utilized to impart forces to the teeth for movement of the same within the bone structure of the patient. In the past, metal brackets and other orthodontic appliances have been bonded directly to the enamel surface of the patient's teeth in position for optimum connection with arch wires and other orthodontic devices. Direct attachment of metal brackets to the tooth structure has not been satisfactory because of the difficulty of providing a bond between a metal surface and the enamel surface of the tooth. Thus far, no bonding agent has been found that will provide a desirable and controllably releasable bond between metal brackets and the enamel of the teeth.

Direct bonding of metal brackets to the tooth structure is also undesirable from the standpoint of removal of the brackets or appliances after completion of orthodontic treatment. If the bond between the metal and enamel is sufficient to retain the same in assembly during treatment, the bonding material will typically refuse yield readily after treatment and it is possible to damage the enamel as to the metal is separated from the enamel. Removal of the metal structure from the enamel by grinding or other mechanical operations is not conveniently possible because of the heat that is generated and because of the susceptability of the teeth to damage by metal working tools.

Another disadvantage of the conventional band type method of accomplishing orthodontic treatment is the problem of tooth decalcification that frequently occurs during treatment. The cement that is typically employed to attach the bands to the individual teeth is typically susceptible to being disolved by the action of the saliva, thereby causing spaces to develop beneath the bands and these spaces are usually not detectible. The spaces beneath the bands can accumulate food product, and, because of the action of the saliva thereon, the food product will develop an acid that causes demineralization of the tooth structure. In some cases, caries will develop because of the action of the acid in the spaces under the bands, but the most typical result is demineralization, which develops tooth discoloration that logically detracts from the aesthetic appearance of the teeth.

Conventional orthodontic bands also have rather sharp marginal edges and protrusions that may constantly irritate the gingiva, causing pain to the patient and detracting from the ability of the patient to keep his teeth hygenically clean during the period of orthodontic treatment. Infection of the gingiva is a constant problem when orthodontic treatment is conducted with metal bands about the teeth.

Brackets and other orthodontic appliances composed of plastic material have been successfully bonded to the enamel surface of teeth to provide for orthodontic