

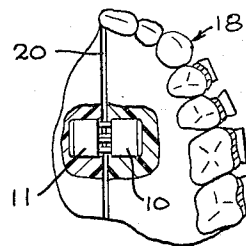
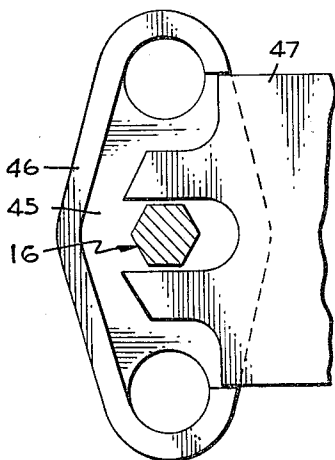
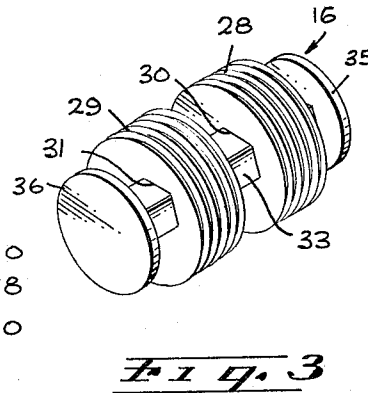
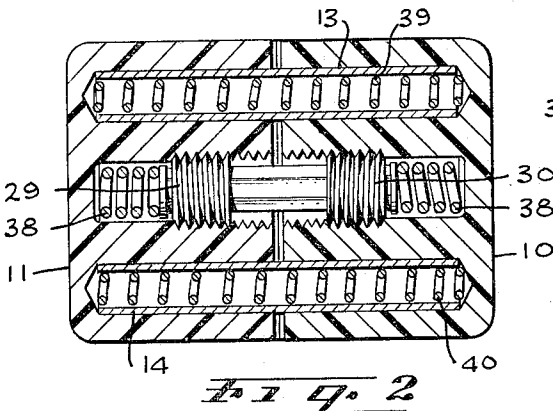
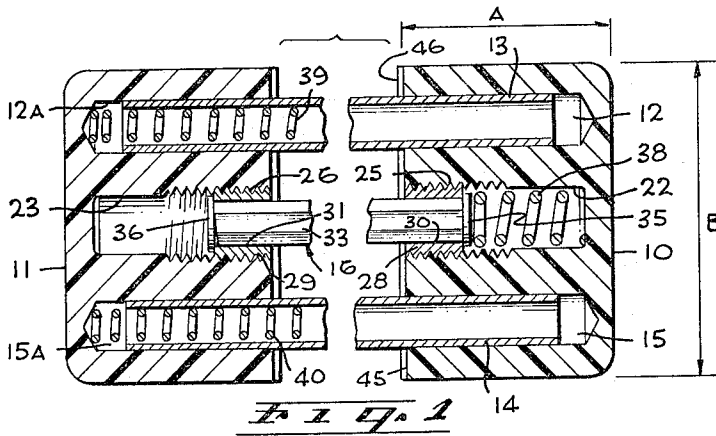
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ORTHODONTIC EXPANDER

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1

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**ORTHODONTIC EXPANDER**

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1 Claim. (Cl. 32-14)

This invention relates in general to orthodontic appliances, and specifically to an expander device for incorporation into appliances for correcting natural teeth.

The form of appliance to which the expander device of this invention is applicable, is one of plate-like form to be worn in the mouth in the manner of an artificial denture but which is devoid of teeth and is of divided form to comprise two main parts adapted to bare against the teeth on opposite sides of the mouth.

There are other possible uses of such expander devices, but this invention is principally applicable to such an environment as described. Wherever such an appliance may be employed for any correction of teeth, this invention will be applicable. One known application for the use of the appliance is the correction of a dental condition of children known as "overcrowding" which implies that the jaw is too small to maintain the teeth in correct relationship.

The expander device is made to engage the teeth in any desired fashion and the pressure is provided through the expansion of the device to act upon the teeth.

One of the objects of the present invention is to provide such an expander device for this type of appliance with a uniform pressure application, but a definitely ascertainable limit to the distance the expander will open during a period while the patient is away from the doctor's office, thus preventing over-correction or at a rate faster than proper for the bone structure.

Another object of this invention is to eliminate the need for any minute openings for adjustment purposes, which openings can accumulate food particles.

Another object of this invention is to make adjustment of the appliance very easy with a proper tool, but quite difficult without such tool.

A still further object of this invention is to provide an expansion spring device which is normally quite long in ratio to the overall length of the expander device, and thereby provides a more uniform application of pressure over the entire operative range of the device.

A still further object of the invention is to provide a greater travel of the expander device in relation to its overall length.

Another object of the invention is to reduce the dimensions of the device in all directions, in order that the appliance in which it is incorporated may be constructed to a minimal wall dimension.

An additional object is to provide a construction of lower cost than currently available in the art.

In accordance with these and other objects which will become apparent hereinafter, a preferred form of the present invention is disclosed in the accompanying drawings wherein:

FIGURE 1 is a section view through an expander device made according to the principles of this invention, illustrating one type of spring location on the left portion and another type of spring location on the right hand portion.

FIGURE 2 is a view similar to the section of FIGURE 1, showing springs in all possible location for maximum pressure.

2

FIGURE 3 is a perspective view of the stop means employed to bridge the bodies and limit the degree of separation.

FIGURE 4 is a partial view of an appliance placed in the mouth of the patient illustrating the location of the expander device of FIGURES 1 and 2.

FIGURE 5 is a detail illustration of a means to prevent casting plastic material where undesired.

The illustrated embodiment of the invention is composed of two synthetic resin plastic bodies 10 and 11. A bore 12 is adapted to hold a guide tube 13 in the body 10 with a slideable fit. A similar bore 12A is provided in the body 11. Thus, the guide tube 13 holds the two bodies in alignment but axially shiftable with respect to one another.

A tube 14 is slideably engaged within a bore 15 in body 10 and a bore 15A in the body 11. By the use of two guide tubes 13 and 14, the bodies are aligned for longitudinal movement, and held also against rotational movement with respect to one another.

A turnbuckle device 16 is provided in the central area between the two bodies and provides a stop means effect. That is, by adjustment of the turnbuckle structure, the maximum limit of separation may be established.

In FIGURE 4, an appliance 18 is illustrated. FIGURE 4 is partly broken away and illustrates two halves of a denture-like structure having a parting line 20 where the two halves mate. The device of this invention is employed to bridge the gap of the parting line 20 and to provide a separation force tending to enlarge the gap of the parting line 20 and spread the two halves apart. As many of the devices as needed are employed to bridge the gap of the parting line. Furthermore, the parting line may traverse the mouth in a lateral direction separating the appliance from front to back if desired. This is an illustration of the use of the present invention, and there are other possible uses in similar devices.

Returning then to the illustration in FIGURES 1 and 2, the body 10 has a central bore 22 and the body 11 a central bore 23. The bores open with a mouth portion adjacent one another and are threaded from the mouth portion inwardly a portion of the depth of the bore. Threaded portion 25 in body 10 and threaded portion 26 in body portion 11 may be seen in FIGURES 1 and 2.

Refer to FIGURE 3. This figure illustrates the turnbuckle device, which is an adjustable stop limit used to establish the maximum distance that the two bodies 10 and 11 may separate, but permitting the bodies to be pressed together in complete abutment.

This turnbuckle or stop means device, employs two peripherally threaded nuts 28 and 29 which engage respectively with the threaded portions 25 and 26 as may be seen in the sectional views 1 and 2.

Each of the nuts 28 and 29 have a noncircular through opening 30 and 31 respectively in the axial area of the nut. A noncircular rod 33 is engaged in the openings 30 and 31 for longitudinal sliding movement, but because of the noncircular form of opening and rod, they are non-rotative with respect to one another. In the illustration the openings and the rod are hexagonal. The rod is a standard product which may be purchased as a standard item of commerce, and need not be specially made. The hexagonal through openings 30 and 31 may be broached with ease. Hence, this structure is quite inexpensive.

To keep the rod and nuts assembled as shown in FIGURE 3, washers 35 and 36 are secured on opposite ends of the rod as illustrated. Welding, soldering, or mechanical fitting will suffice.

When the nuts 28 and 29 are engaged into the threaded portions 25 and 26 as illustrated in FIGURE 1 and 2, the bodies 10 and 11 may separate until the washers 35 and 36 abut the sides of the nuts. This is the limit of separation. The threads of the portions 25 and 26, and consequently the threads of the nuts 28 and 29, are of opposed hands, and therefore the rod 33 may be rotated to drive both of the nuts deeper into the bores in which they reside, or may be rotated in the opposite direction to withdraw the nuts. Hence, the orthodontist may quickly set the maximum distance of separation available to the bodies 10 and 11.

As illustrated in FIGURE 2, the nuts 28 and 29 have been run deep into the bores to the end of the threaded portions 25 and 26, and hence the body portions 10 and 11 are held at almost a contact condition. In FIGURE 1, the nuts 28 and 29 are at the mouth areas of the bores and hence maximum separation of the bodies 10 and 11 is permitted.

The use of the threaded portions of the bores, with the threaded engagement of nuts 28 and 29, is a discovery of this invention which provides unusual stability and rigidity of alignment in this appliance, not available in prior art devices. This structure is not the only feature of the present invention, but is quite desirable and provides this stability in an economical and useful manner. It is possible to provide stop devices without this threaded engagement, but this engagement has provided a rigidity which is found to be quite desirable in the appliance. Such structures are subject to considerable stress whenever the patient handles the completed orthodontic structure after leaving the doctor's office. In order to prevent damage, prior devices have been made quite rugged and hence, thick. In order to overcome this thickness which is objectionable, the present invention provides the threaded engagement of the turnbuckle stop device to aid and assist the rigidity provided by the outrigger guide tubes.

Additionally, the threaded engagement prevents the accumulation of food particles within the expander. The bodies 10 and 11 are made of synthetic resin, and hence act as washer material. The nuts 28 and 29 may also be made of synthetic material, or of metal, and in either case, the fit of the nut into the threaded portion may be made relatively wide in tolerances and yet produce a very satisfactory seal against accumulation within the bores, in addition to providing the rigidity desired.

Another feature of this invention is provided in the spring structure and the variety of arrangements possible. In FIGURE 1 the drawing is broken in the middle in order to contrast the condition on the right hand side to that on the left. Note that the guide tubes 13 and 14, on the left hand side, contain springs. These springs extend the full length of the appliance in maximum extension, and apply pressure even at full extension position. This is a distinct advantage because the long springs thus available provide a far more uniform pressure over the entire expansion range than would be possible by shorter springs placed in the ends of bores 22 and 23. The springs are indicated by the reference characters 39 and 40 in the left side of FIGURE 1, and short length springs 38 are illustrated in the central position on the right section of the drawings. Only one spring 38 appears in the FIGURE 1 because of the divided nature of the illustration, but two such springs are shown in FIGURE 2. In this location the springs are short and exert their pressure over a relatively short range changing depreciablely as the range is extended. Nevertheless, it is possible in some instances that such a change is desirable and hence it is possible under the construction of the present invention to place springs 38 behind the washers 35 and 36 in the bores 22 and 23 and eliminate springs 39 and 40 from the guide tube.

However, it is more often desired, in the use of the present invention, that the springs 39 and 40 are used

to the exclusion of any other resilient means, but that in stubborn cases, springs 38 are added in addition thereto, rather than as a replacement for the springs 40 and 39. Hence, in FIGURE 2 is shown the ability of the present invention to provide extreme capacity of force. This force, if plotted, has a reducing curve as the expansion takes place, due to the faster reduction of force from the springs 38. Nevertheless, the springs 39 and 40 reproduce a uniform pressure, upon which this reducing force is superimposed, and provides the expansion force beyond the effective curve portion of the springs 38.

In FIGURE 5, the end wall of one of the bodies 10 and 11 are illustrated. According to this invention the faces of the bodies 10 and 11 may be brought quite closely together because there does not exist the need for a big space between the two halves for engagement of wrenches and other devices. Some space is required, however. Hence, the ends of bodies 10 and 11 are provided with a recess area 45 with a rim 46 around the major portion of the face as illustrated. Into the remaining space is inserted a plug 47, which is a thin sheet member, preferable of metal formed to extend around the central rod 33 and to fill up the area that is left between the ends of the rim 46. Therefore, when the two halves are placed together and put into position in a mold for the casting of a finished appliance, the material from which the appliance is made will not run into the area between the two halves and cause the rods 33 to become inaccessible. The plug 47 serves as a handle to position the expander device. Then, after the casting of the finished appliance has been completed, the plug 47 is pulled from the appliance and an access is made available for a thin wrench to slide into engagement with the rod 33 in order that adjustment may be made. The faces of the rim 46 are in tight engagement to prevent infiltration of the casting material from that direction, but they do not adhere to one another and therefore separate readily whenever the wrench is placed over the rod 33.

The wrench is not illustrated, being a sheet metal member about the thickness of the plug 47 and having a bit shaped with a slot the width of the distance across the rod 33 and hence may be used in the manner of a wrench to cause rotational adjustment.

In the FIGURE 1, the dimensions to the body 10 have been labeled with dimension A and dimension B representations. This label has been applied in order to emphasize the foreshortened ratio of the bodies 10 and 11 to emphasize the fact that this invention provides both a short and thin structure because of the compact nature of the members forming the structure. Length is a serious problem in devices adapted to fit within the curved mouth of a child. In the prior art, either the appliance is made thick in order to give plenty of room for a long appliance, or the expander is only partially encased within the material of the appliance. Neither condition is satisfactory. According to this invention, having a ratio wherein the length is actually less than the width of the body 10, a much thinner mouthpiece construction is possible.

While the instant invention has been shown and described herein in what is conceived to be the most practical and preferred embodiments, it is recognized that departures may be made therefrom within the scope of the invention which is therefore not to be limited to the details disclosed herein but is to be afforded the full scope of the claim.

What is claimed is:

An orthodontic appliance, comprising:  
first and second body members;

each body member having a recess bore, and said bodies placed with the said bores thereof in axial alignment;

each bore having a mouth entrance opposed to a like mouth entrance of the other, each bore having a threaded wall beginning at said mouth entrance;

5

a first and second nut threadably engaged in a bore of said first and second body member respectively; each nut having a noncircular central axial through opening;

a noncircular rod engaged in said central axial through opening of both nuts with a longitudinally slideable and non-rotatable fit, stop means on the opposite ends of said rods within the respective bores to prevent said rods from pulling out through the nut; and resilient means urging said bodies apart.

6

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