

March 22, 1932.

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1,850,768

EXPANSION DEVICE FOR ATTACHMENT TO MASONRY OR TILE

Filed Jan. 31, 1931

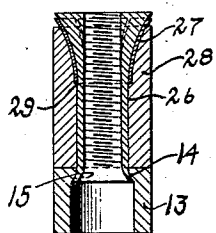
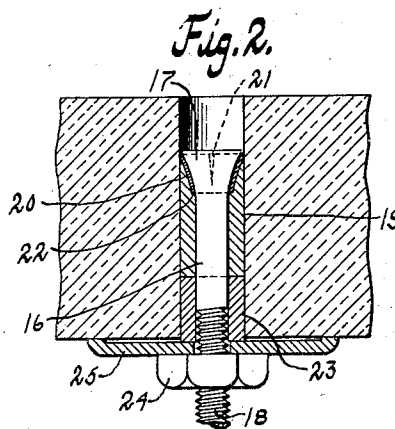
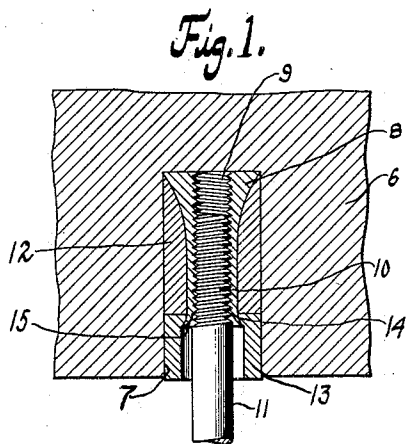


Fig. 3.

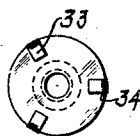


Fig. 5.

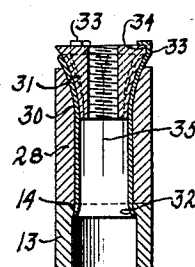


Fig. 4.

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EXPANSION DEVICE FOR ATTACHMENT TO MASONRY OR TILE

Application filed January 31, 1931. Serial No. 512,646.

This invention has reference to an improved construction of inserts or expansion devices for attaching bolts, fixtures or the like to masonry, tile, brick work, marble, glass, or the like.

Generally considered, it is the object of the present invention to provide an expansion insert of the character above referred to which is simple and rugged in construction and which will afford very great strength when secured in position.

More specifically the present invention contemplates an expansion bolt or device of this general type, the setting or securing of which does not require or necessitate the use of any specially constructed or shaped tools.

Additionally, it is an object of the present invention to provide an expansion unit adapted to be secured in an aperture formed in supporting structures such as relatively thin slabs of marble, tile or glass in which no backing or base is present against which the devices may react during setting or expansion.

Another object of importance is the provision of what I have termed a "setting collar" preferably secured to or carried by the device itself in order, firstly, to take the place of specially formed setting tools heretofore employed and, secondly, complete or leave smooth the surface of the structure to which the device has been applied.

The specific nature of the foregoing objects and advantages as well as of others which will occur to those skilled in the art will be more apparent from a consideration of the appended drawings taken with the detailed description herebelow.

Of the drawings—

Figure 1 is a longitudinal sectional view through one form of expansion device, the view illustrating the application of the device to masonry or the like;

Figure 2 is a view similar to Figure 1 illustrating another form of device embodying various improvements of the present invention;

Figure 3 is a sectional view of a third expansion insert construction, this view illus-

trating the device prior to expansion in an aperture or hole; and

Figures 4 and 5 are longitudinal sectional and end elevational views, respectively, of still another embodiment of various features of the present invention.

Referring now particularly to Figure 1, it will be seen that I have therein illustrated a portion of masonry-work or the like at 6, the same being provided with a cylindrical bore or aperture 7 adapted to receive an expansion device. In this figure, furthermore, the device shown as applied to the masonry-work includes a tapered or flared part 8 having screw threads 9 internally thereof in order to cooperate with complementary threading 10 on the bolt 11. The tapered part or member 8 is considerably extended lengthwise of the bolt 11 and surrounded by a sheath or sleeve 12 of any suitable soft metal such as lead. In addition, this construction includes a setting collar 13 which abuts against the outer edge of the lead sheath 12 and, preferably, is secured to or carried by the nut structure 8 by means of an internal shoulder 14, over which the outer end of the elongated shank portion of the tapered member 8 may be bent or swaged as indicated at 15. This expansion device, therefore, in its preferable form is secured together as a unit at the time of its manufacture so that it is necessary only to insert the entire structure into the aperture to which it is to be applied.

In setting an expansion insert of the type illustrated in Figure 1, it is only necessary to draw up on the bolt 11, it being understood that any suitable means of reaction (for example, a bolt head or a facing plate) will be interposed between the bolt and the outer edge of the collar 13. Alternatively, I may employ any suitable hammering tool or the like in order to drive the setting collar 13 inwardly against the adjacent edge of the lead sheath 12. In any event, the setting action compresses the lead and causes it to flow or "ooze" inwardly and outwardly to fill all cracks and crevices by virtue of the reaction against the tapered or flared end portion of the member 8.

In considering the modified construction

illustrated in Figure 2, attention is first called to the fact that this particular form is especially adapted to application to structures in which no backing is provided against which the device may be driven or "set". This situation is encountered in most places where thin slabs of marble, tile or glass are employed and, ordinarily, when it is desired to apply or secure some device to such marble, tile or glass, the depth or thickness of the material is such that even if the aperture or bore is not extended entirely therethrough, still the thickness remaining is of insufficient strength to withstand the force ordinarily necessary in driving or setting expansion inserts.

It is to this particular field that the construction shown in Figure 2 is especially adapted. The device here disclosed includes a bolt structure 16, preferably made in one piece, which includes a tapered or flared part or head 17 at one end thereof and a threaded shank portion 18 at the other end thereof. This modified form, furthermore, includes a soft metal or lead sheath or sleeve 19 surrounding at least a portion of the tapered part 17. Interposed between one end of the sleeve 19 and the adjacent tapered part 17 is an expansible sleeve or ferrule 20, preferably stamped from sheet metal and provided with slits or slots extending only partly throughout the length thereof as indicated at 21.

This ferrule 20, furthermore, is preferably of substantially conical shape in order to approximate the configuration of the tapered part 17. Additionally, the lead sheath 19 is originally provided with an internal shoulder 22 adapted to abut against the smaller or inner edge of the ferrule 20. Also, during manufacture of these parts, it is desirable to form the lead sheath 19 and the parts 17 and 20 of substantially equal outside diameter at their largest points for reasons which will appear more clearly hereinafter.

In the form of Figure 2, a setting collar 23 is also provided and in setting or securing this particular device in place the following steps are carried out:

After suitable assembly of the various parts already described substantially as indicated in Figure 2, a nut 24 is applied to the threaded stem 18, either with or without the interpositioning of a suitable facing plate 25, and drawn up sufficiently to react against the outer edge of the setting collar 23. The first result of drawing up the nut 24, after contact thereof with the setting collar, is to advance the lead sheath and the expansible sleeve 20 somewhat farther over the tapered part 17. This causes the inner (and larger) edge of the ferrule 20 to expand or enlarge until it abuts rigidly against the inner surface of the aperture in the material to which it is being applied. Additional telescopic movement of the flared part 17 and the lead

sleeve 19 increases the force or pressure with which the ferrule 20 engages the inner surface of the aperture and compresses and "oozes" the lead into all cracks and crevices in order to provide the desired frictional engagement between the lead and the inner surface of the aperture.

At this point it should be noted that the spreading or expanding action of the ferrule 20 is important in preventing flow of lead past the head of the tapered member 17, this action, obviously, being detrimental as it limits the strength of the frictional engagement of the parts. In Figure 2, of course, the insert is shown in completely expanded position and it will be noted that at this time the largest diameter of the ferrule 20 slightly exceeds that of the tapered part 17.

Proceeding now to Figure 3, the device illustrated therein, it should be noted, is similar in many respects to that shown in Figure 2. In this form, however, instead of the central bolt structure 16 of Figure 2, I have provided an internally threaded and externally flared nut device 26 which is similar in all essential respects to the tapered part 8 of Figure 1. Figure 3 further shows the application of an expansible ferrule or sleeve 27 between the flared portion of the nut 26 and the surrounding lead sleeve 28. This lead sleeve also has an internal shoulder 29 adapted to cooperate with the inner and smaller end of the ferrule 27 for the purpose above referred to in connection with the construction of Figure 2. Figure 3, furthermore, resembles Figure 1 by the inclusion of a setting collar 13 which is preferably attached to the inner end of the nut 26 as by the cooperating parts 14 and 15.

The operation of the form shown in Figure 3 will be apparent from a consideration of the above discussion, although it should be noted that in this view the device is illustrated prior to expansion at which time the external diameters of the parts 26, 27 and 28 are substantially equal as above noted in connection with Figure 2. This equality in diameter of these parts is advantageous because, when the device is inserted into an aperture of a similar diameter, only a relatively small amount of expansion, particularly of the expansible or slitted sleeve, need be effected in order to obtain engagement with the aperture wall.

In Figures 4 and 5 I have illustrated still another form of expansion device embodying various of the improvements and features discussed hereabove. In accordance with this showing, a lead sheath or sleeve 28, similar to that applied to Figure 3, is disposed around the shank and tapered portion of an expansible ferrule 30 which is extended or elongated considerably over those of Figures 2 and 3. This form also differs from the others by the inclusion of a relatively short in-

ternally threaded and externally flared or tapered part 31 which is telescopically arranged with respect to the extended ferrule 30. Furthermore, in this particular instance, a setting collar 13 having an internal shoulder 14 is secured to the inner end of the elongated shank of the part 30 as by means of the swaged portion 32.

At its other end the sleeve or expansible element 30 is provided with fingers or lips 33 (see Fig. 5) which are fitted or received in suitable apertures 34 formed in the outer edge of the flared nut 31. It is also preferable in this form to arrange the expansible part 30, the sheath 28 and the nut 31 with substantially equal outside diameters and in order to maintain this uniform external configuration of the entire device the slots or recesses 34 of the part 31 are preferably equal in depth to the thickness of the fingers or lips 33.

The construction of Figure 4, similarly to that of Figures 2 and 3, when drawn up or "set", first causes an expansion or enlargement of the ferrule 30 in order to engage rigidly and firmly the inside surface of the bore to which the device is being applied. It might also be noted at this point that the ferrule 30 in this form is also arranged or constructed for expansion by being suitably slitted lengthwise thereof as indicated at 35. It will be noted, however, that the slits 35 of this construction extend not only throughout the entire flared portion of the ferrule 30 but also toward its outer end in the shank portion. This permits greater expanding action and, therefore, is especially useful for certain types of work, for example, where the bores or apertures provided are relatively large as compared to the outside diameter of the inserts or where the inside surface of such bores or apertures are relatively rough or irregular.

In addition to this advantage, the construction of Figures 4 and 5 provides for an expansion insert, all the various parts of which will remain secured together as a unit before it is applied or "set".

In connection with all of the forms of inserts above described, it should be noted that while it is desirable to have the setting collars secured to the device, this, of course, is not essential for all purposes and, indeed, might even be undesirable in some instances, so that I contemplate utilizing the "setting collar", whether it be secured to or supplied separately with the inserts.

It will also be obvious that where it is not necessary or where it is undesirable to have a member such as my "setting collar" permanently secured in place along with the remainder of the device, it may be eliminated and a tool such as those heretofore employed may be adopted for "setting" purposes.

In connection with the showing of Figures

2 to 5 inclusive, particular attention is called to the fact that the interposition of an expansible ferrule, constituting in effect, an expansion head, preferably of very hard metal, between the lead sheath and an inner tapered or flared part very substantially increases the strength of the connection provided, for the reason that it prevents "oozing" of the lead past or around the end of the tapered part. Indeed, in some instances, the application of such an expansible ferrule to inserts similar in character to those heretofore employed, has increased their strength to twice or more than that afforded without the expansible ferrule.

With this in mind it will be apparent that in order to obtain a connection of given strength, I may, in many cases, employ soft metal or lead sheaths which are very much softer than those ordinarily employed. This feature also materially extends the usefulness of devices of this character. For example, in relatively soft structures such as tile, or in structures which are readily chipped or broken, my inserts may be employed very readily even where the application of this general type of insert has, as a practical matter, been impossible heretofore on account of the relative hardness of the material commonly and necessarily used in making the "soft metal" sheaths.

I claim:

1. An expansion insert for attachment to masonry, tile or the like including in combination a tapered member, a setting collar and a soft metal part between the tapered member and the setting collar, and a hard metal expansion sleeve between the tapered member and the soft metal part, the setting collar being arranged adjacent to the soft metal part prior to expansion of the insert, whereby to provide for expansion by advancing the setting collar against the soft metal part.

2. An expansion insert for attachment to masonry including in combination, a tapered nut structure, an expansible ferrule surrounding said nut structure, a soft metal part surrounding said ferrule, and a setting collar engaging said part, the setting collar being arranged adjacent to the soft metal part prior to expansion of the insert, whereby to provide for expansion by advancing the setting collar against the soft metal part.

3. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like including in combination a tapered member, a setting collar secured to said tapered member and a soft metal part between the tapered member and the setting collar, and a hard metal expansion sleeve between the tapered member and the soft metal part.

4. An insert of the character described adapted to be expanded after insertion into

an aperture in masonry including in combination, a tapered nut structure, an expandible ferrule surrounding said nut structure, a soft metal part surrounding said ferrule, and a setting collar carried by said ferrule and engaging said part.

5. An insert of the character described adapted to be expanded after insertion into an aperture in masonry including in combination, a tapered nut structure, an expandible ferrule surrounding said nut structure, a soft metal part surrounding said ferrule, and a setting collar engaging said part, said ferrule having means engaging the nut structure to prevent detachment thereof.

6. An expansion insert for attachment to masonry or the like, including in combination, a nut device having a part with a substantially conical outer surface, an expandible ferrule having a sleeve like portion and a belled end fitting said nut, a setting collar movably carried by said ferrule, means on said ferrule for preventing displacement of the setting collar from the ferrule, means on said ferrule for preventing displacement of the nut device from the ferrule, and soft metal surrounding the ferrule and located between the setting collar and the belled end of the ferrule.

7. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like, said insert including a cylindrical soft metal part, a tapered member positioned, at least partially, within one end of the soft metal part, and a tapered sleeve having an expandible portion interposed between said part and said member, said member and said sleeve having interengaging means serving to secure them together.

8. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like, said insert including a cylindrical soft metal part, a tapered member positioned, at least partially, within one end of the soft metal part, and a tapered sleeve having an expandible portion interposed between said part and said member, said member and said sleeve having interengaging means serving to secure them together, with said sleeve extended through the soft metal part toward the other end thereof.

9. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like, said insert including a cylindrical soft metal part, a tapered member positioned, at least partially, within one end of the soft metal part, and a tapered sleeve having an expandible portion interposed between said part and said member, said member and said sleeve having interengaging means serving to secure them together, with said sleeve extended through the soft metal part and projecting from the

other end thereof, together with a setting collar positioned adjacent the soft metal part by engagement with the projecting end of said sleeve.

10. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like, said insert including a cylindrical soft metal part, a tapered member positioned, at least partially, within one end of the soft metal part, and a tapered sleeve having an expandible portion interposed between said part and said member, with said sleeve extended through the soft metal part and projecting from the other end thereof, together with a setting collar positioned adjacent the soft metal part and secured to the projecting end of said sleeve.

11. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like, said insert including a cylindrical soft metal part, a tapered member positioned, at least partially, within one end of the soft metal part, and a tapered sleeve having an expandible portion interposed between said part and said member, said member and said sleeve having complementary and interengaging recesses and projections serving to secure them together.

12. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like, said insert including a cylindrical soft metal part, a tapered member positioned, at least partially, within one end of the soft metal part, and a tapered sleeve having an expandible portion interposed between said part and said member, said sleeve and said part having complementary interengaging means, whereby relative telescopic movement of the tapered member and the soft metal part causes relative telescopic movement of said member and said sleeve.

13. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like, said insert including a cylindrical soft metal part, a tapered member positioned, at least partially, within one end of the soft metal part, and a tapered sleeve having an expandible portion interposed between said part and said member, said sleeve and said part having complementary interengaging means, whereby relative telescopic movement of the tapered member and the soft metal part causes relative telescopic movement of said member and said sleeve, together with means for relatively telescoping the soft metal part and said member including a setting collar engaging the said part, and means reacting between the tapered member and the collar.

14. An insert of the character described adapted to be expanded after insertion into an aperture in masonry, tile or the like, said

insert including a cylindrical soft metal part,
a tapered member positioned, at least partially,
within one end of the soft metal part,
and a tapered sleeve having an expansible
portion interposed between said part and said
5 member, said sleeve and said part having
complementary interengaging means, whereby
relative telescopic movement of the tapered
member and the soft metal part causes relative
10 telescopic movement of said member and
said sleeve, together with means for relatively
telescoping the soft metal part and
said member including a setting collar carried
by the insert and engaging the said part,
15 and means reacting between the tapered member
and the collar.

15. An insert of the character described
adapted to be expanded after insertion into
an aperture in masonry, tile, or the like, said
20 insert including a tapered member, a cylindrical
soft metal part at least partially surrounding
the tapered member, and a setting collar
positioned adjacent the soft metal part
and having an intumed projection or flange,
25 the tapered member having a portion thereof
swaged outwardly to engage said intumed
flange and thus prevent separation of the
parts.

In testimony whereof I have hereunto
30 signed my name.

DANIEL N. PEIRCE.

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