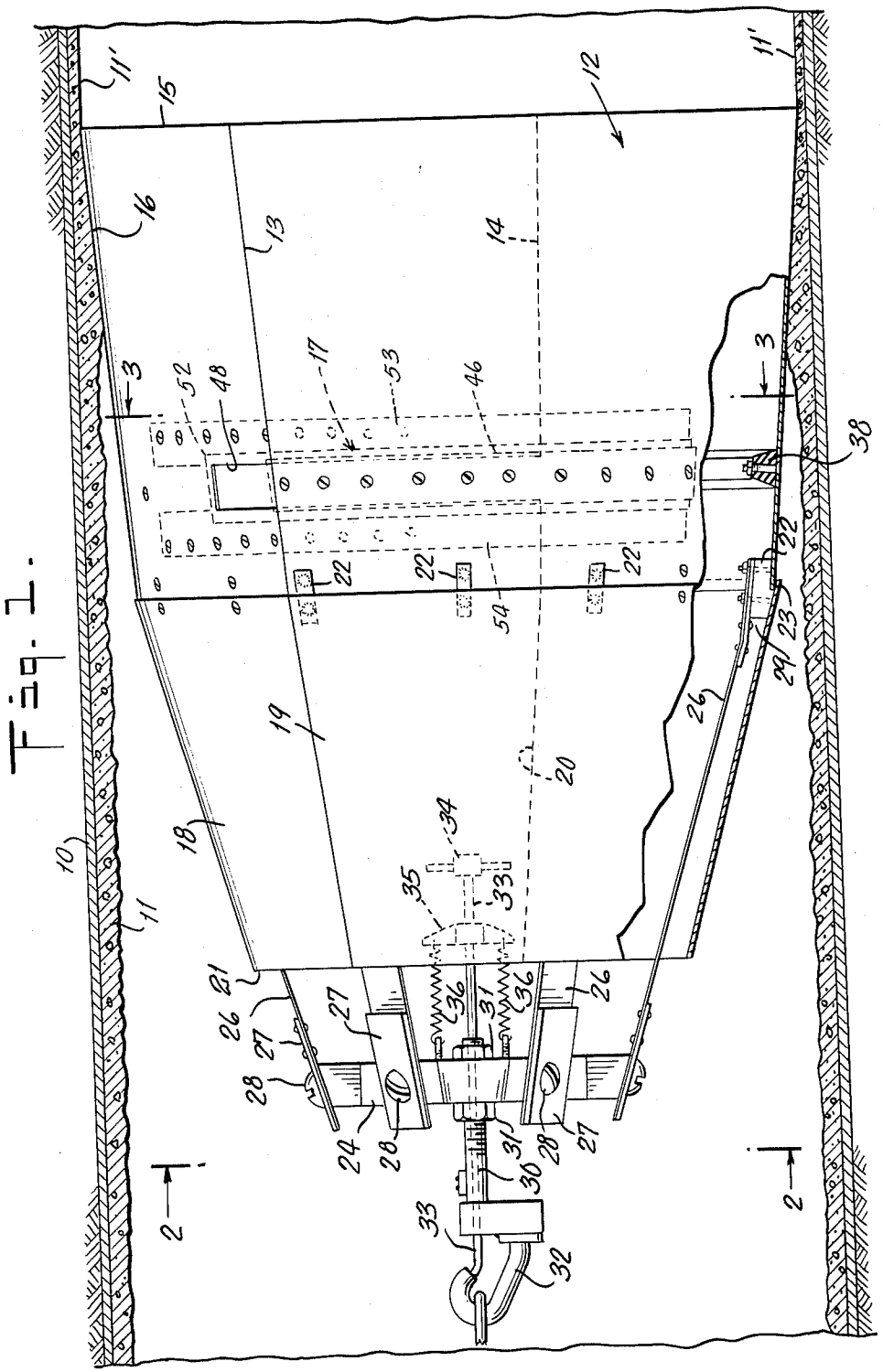
June 28, 1966 F. E. RUEGSEGGER 3,257,697

APPARATUS FOR TROWELING PIPE LININGS OF MORTAR

Filed May 12, 1964 4 Sheets-Sheet 1

Fig. 1.



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APPARATUS FOR TROWELING PIPE LININGS OF MORTAR

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Fig. 2.

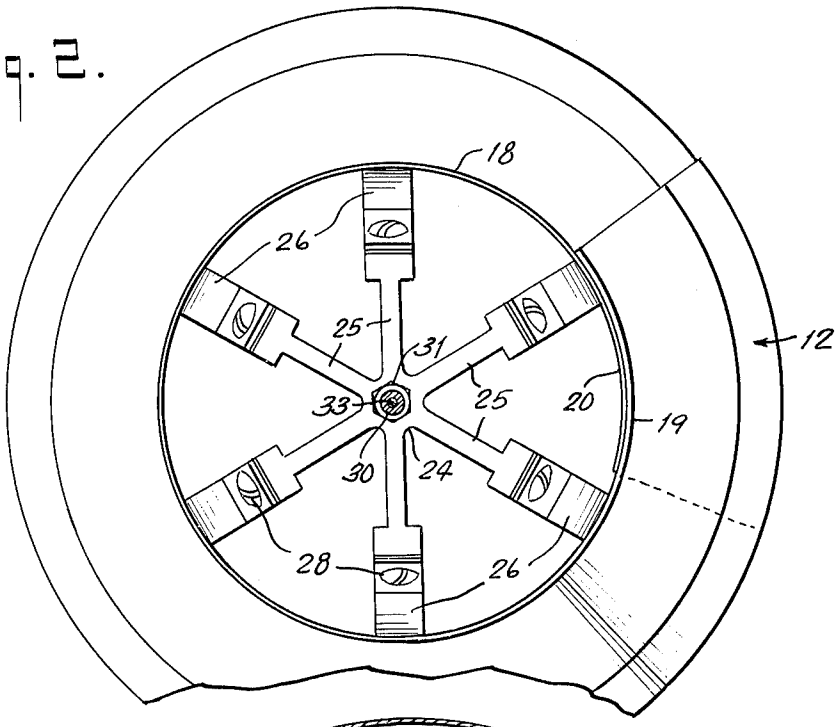
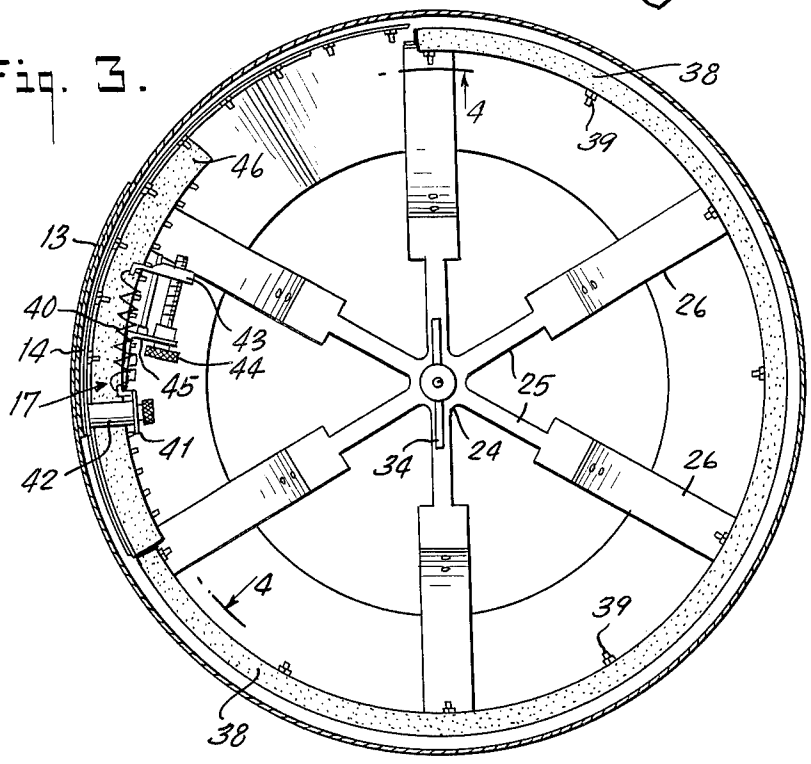


Fig. 3.



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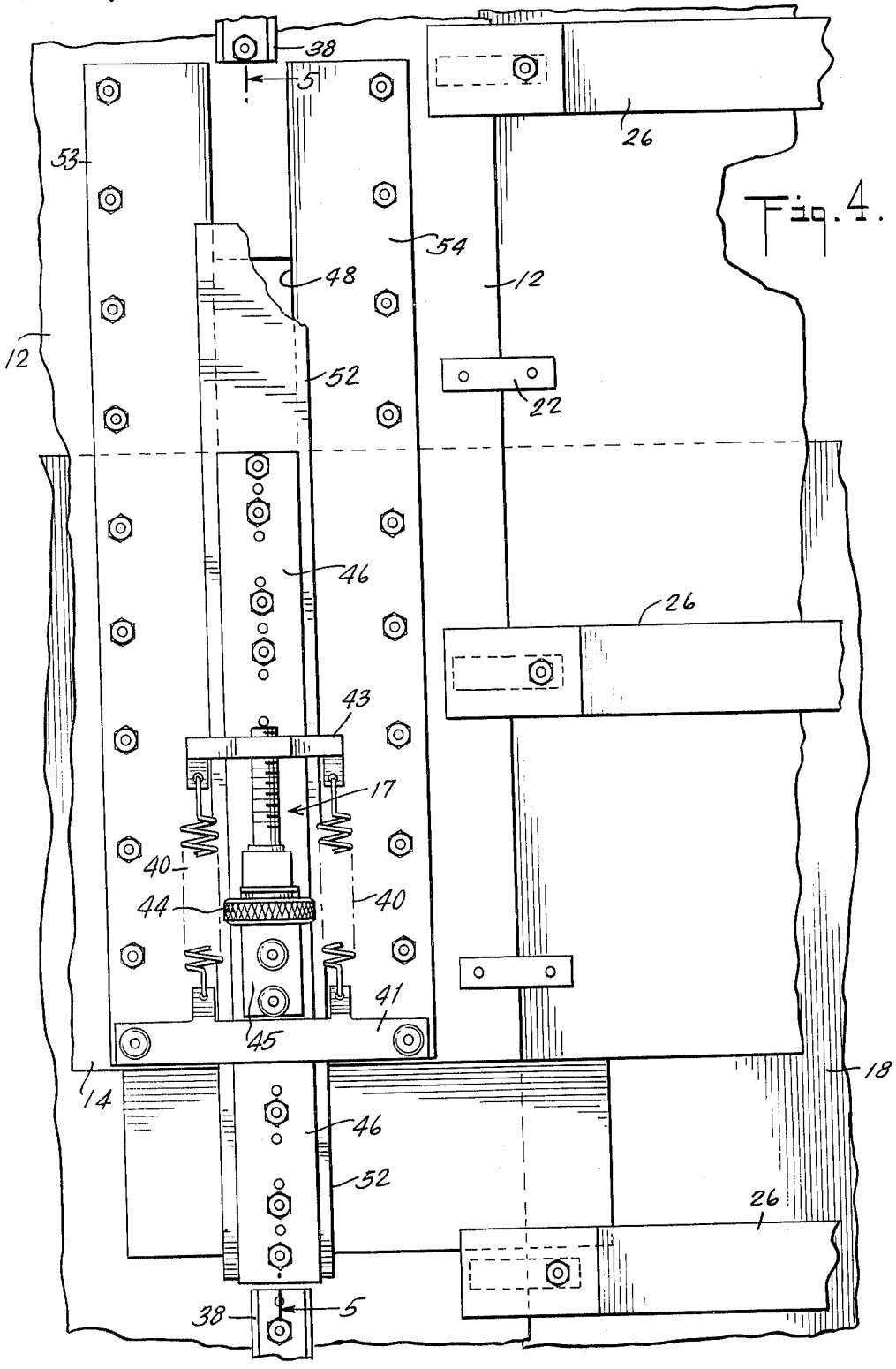


Fig. 4.

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APPARATUS FOR TROWELING PIPE LININGS OF MORTAR

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Fig. 5.

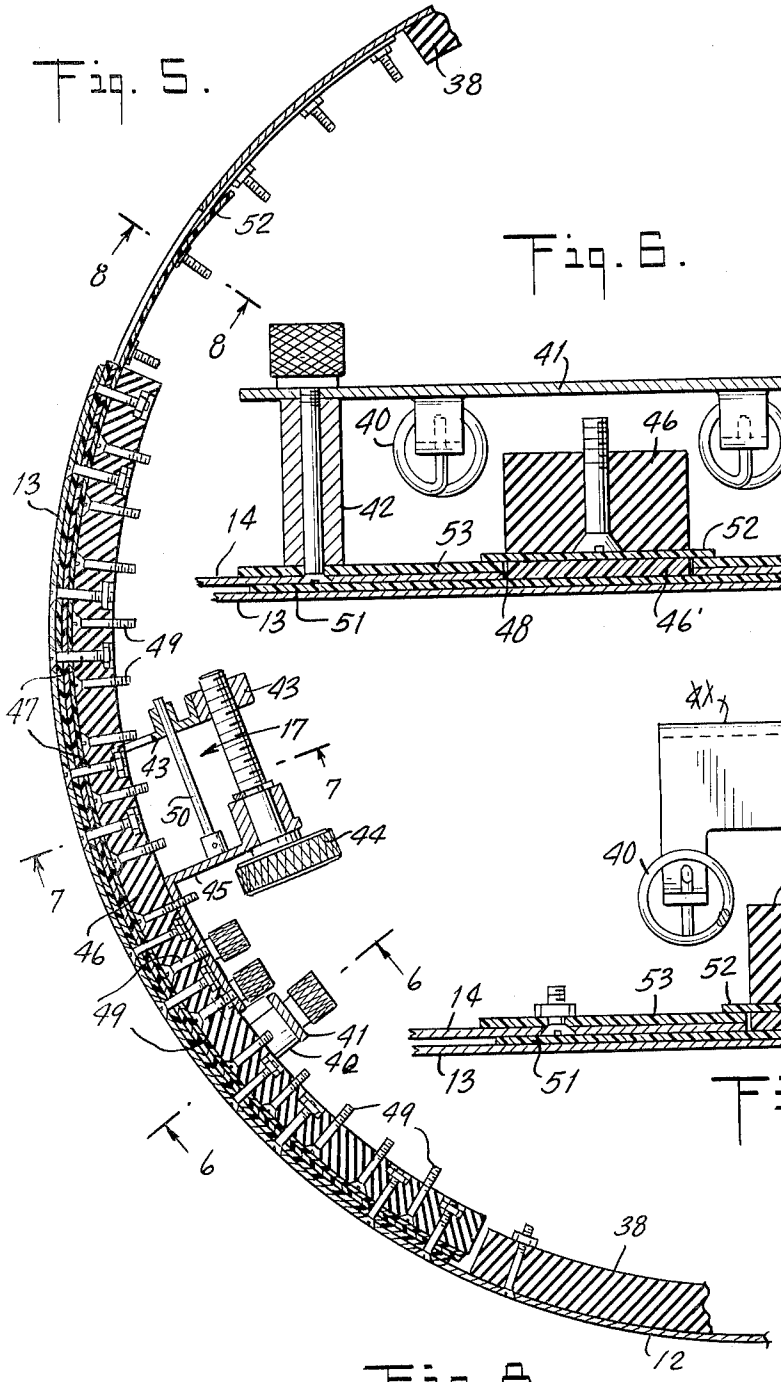


Fig. 6.

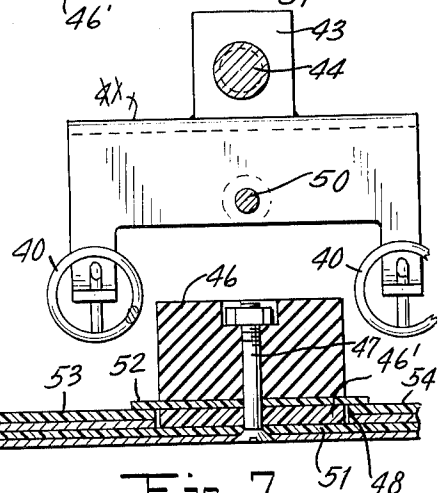
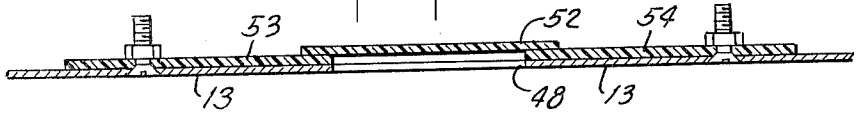


Fig. 7.

Fig. 8.



United States Patent Office 3,257,697 Patented June 28, 1966

3,257,697

APPARATUS FOR TROWELING PIPE LININGS OF MORTAR

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4 Claims. (Cl. 25—38)

This invention relates to improved troweling means adapted to be drawn through pipes, conduits or the like for troweling and rendering smooth, pipe lining material such as mortar in plastic condition, shortly after such lining material has been lodged in place on the interior surfaces of the pipe.

While various forms of troweling arrangements for this purpose have become available, the provision of such apparatus in a form which will dependably provide a continuous, uniform and quite smooth mortar lining in various sizes of pipe, has continued to present difficulties.

In accordance with the present invention, an improved construction overcoming such difficulties is provided, in which a frusto-conical, resilient, thin sheet metal troweling element is provided, preferably comprised of a single sheet of metal shaped to conform to a cone, with two longitudinal edges thereof overlapping. Means are provided extending circumferentially around within the interior of the smaller or leading end of this troweling element for lending a certain degree of firmness to such leading end, while leaving the trailing end edge portions quite free to flex and smoothly conform to the desired troweled mortar surface, despite variations which may occur from point to point in the thickness of the applied mortar, or variations in the diameter arising from variations in the inside diameter of the pipe. Furthermore, adjustable means are provided at such forward end within the trowel, for resiliently applying force to the overlapped areas of the troweling element, normally tending to decrease the extent of overlapping, thereby tending resiliently to urge the surfaces of the troweling element outwardly to a limited degree at its forward end, while still leaving the trailing end edges free variably to contract circumferentially under the pressure of engagement with the mortar and to the extent necessary for the mortar-smoothing operation.

Other features of the invention concern the manner in which the forward end of the troweling element is resiliently attached to means such as a cable or rod used for dragging the trowel through the pipe, and also means for enshrouding the forward portions of the apparatus for guiding same past any obstructions which may protrude into the pipe and in such manner that when such an obstruction is encountered, it will cause the shrouding means, as well as the troweling element, to flex inwardly to the extent necessary to permit same to pass by the obstruction without unduly interrupting or interfering with the operations.

Various further and more specific objects, features and advantages of the invention will appear from the description given below, taken in connection with the accompanying drawings, illustrating by way of example a preferred form of the invention.

In the drawings:

FIG. 1 is a side elevational view of a preferred embodiment of the invention showing the troweling means being dragged through a pipe which has just been lined with mortar;

FIGS. 2 and 3 are sectional views taken substantially along lines 2—2 and 3—3 respectively of FIG. 1;

FIG. 4 is a developed view of portions of the interior of the trowel, as viewed along the arcuate section line 4—4 of FIG. 3;

FIG. 5 is an enlarged sectional view of portions of FIG. 3; and

FIGS. 6, 7 and 8 respectively are sectional views taken substantially along lines 6—6, 7—7 and 8—8 of FIG. 5.

Referring now to FIG. 1 in further detail, a pipe or conduit being lined is shown at 10, on the interior wall surfaces of which a lining of cement mortar 11 has just been deposited and which is to be troweled into smooth condition, as indicated at 11'.

The troweling element itself comprises preferably a single "leaf" of thin resilient sheet metal, for example stainless steel, as indicated at 12, and which is shaped to substantially frusto-conical form, with edges overlapping, as at 13, 14. As shown, the trailing edge 15 of the troweling element, and portions adjacent thereto as at 16, for a short distance in advance of such edge, come into engagement with the mortar 11, and all these portions are preferably left quite free of internal supporting means, so that they are free constantly to apply such pressure as may be necessary to the mortar surface, which pressure is determined by, and made adjustable within certain limits, by means indicated generally at 17, and located around within the troweling element along a transverse plane through the forward end portion of the troweling element 12.

The forward end portions of the apparatus, including the forward edge of the troweling element 12, are enclosed in a shroud-like member 18, which may be formed of resilient sheet metal like that of the trowel element 12, and this member 18 also preferably is formed of a single sheet of such sheet metal, with edges overlapping as at 19, 20, so as to conform to a frusto-conical shape, the cone angle of which is substantially greater than that of the troweling element 12, so that the forward end edge, as at 21, of the member 18 will be spaced quite widely from the interior of the surface of the pipe and the mortar thereon. Thus, if there should be an obstruction extending substantially into the pipe, such as a nipple or connection for a branch pipeline, then such forward edge 21 will be drawn past such obstruction and the obstruction will then engage the surfaces of member 18, and then the surfaces of the troweling member 12, causing same to be yieldably deformed inwardly of the apparatus enough to permit the obstruction to be passed. It should be noted that the member 18 performs no troweling function, but merely serves to permit the apparatus to be guided past obstructions and also at the same time preventing any loose or foreign material from entering the troweling element itself, and causing fouling of the parts therein. The forward end edges of the troweling element 12 may be secured as by small blocks or straps of metal 22, to the trailing end edges of the member 18, these straps being secured to the respective edges as by screws, or by welding. As indicated at 23, it will be noted that the trailing edge of member 18 is positioned slightly to overlap the forward edge of member 12.

The means for dragging the troweling apparatus through the pipe may comprise at the forward end of the apparatus, a rigid spider-like member 24, having a plurality of arms, as at 25 (see FIGS. 2 and 3) to the end of each of which elongated leaf spring strap-like members as at 26 are attached. The attachment (see FIG. 1) may take in each case the form of a short rigid piece 27 riveted to the member 26 and retained in turn at the spider as by a screw 28. The screws 28 preferably somewhat loosely engage the piece 27 so that the strap-like springs 26, in dragging the trowel forward, leave same free for limited transverse movements in various directions.

The rear ends of the strap springs 26 are secured to the forward end edge of the member 12 by utilizing certain of the above-mentioned small blocks 22, or otherwise (see

FIG. 4). It may be noted that the rearward ends of the spring straps **26** are spaced from the interior wall surfaces of the shrouded member **18** by a thickness equal to the thickness of such blocks **22** (as indicated at **29** in FIG. 1) so that the spring straps **26** do not interfere with the inward yielding of the shroud member **18** at the forward end of the troweling member **12**, when necessary.

A pull-rod **30** extends forward axially of the spider member **24**, to which it is secured as by nuts **31**, and this rod is provided with suitable hook means **32** at its forward end. In order to close the hook means, except when it is being attached to or detached from a pull-cable, the rod **30** may be formed hollow to contain a small slidable rod **33**, the forward end of which normally closes the hook, and the rearward end of which is provided with a pull-handle at **34**. A small yoke **35**, fixed on rod **33**, is connected by springs **36** with spider **24**, and normally causes the rod **33** to be pulled forwardly to its hook-locking position. By pulling rearwardly on the handle **34**, the rod **33** may be withdrawn to open the hook. As best shown in FIGS. 1 and 3, at a transverse plane and interiorly of the troweling element **12** near the forward edge portions thereof, an annular member **38** is securely and firmly attached to the interior surface of the troweling element as by small bolts **39**. This member may be formed of rubber or rubber-like material, or plastic material sufficiently soft to readily bend, and yet firm enough to lend substantial firmness to the forward end portions of the troweling element **12** at the plane of the adjusting means **17**. The member **38** may be interrupted at the location of such adjusting means, as will be apparent from FIGS. 3 and 5.

The adjusting means **17** will now be described with reference particularly to FIGS. 3, 4 and 5. This means comprises preferably a pair of coil springs **40** normally held under tension. One end of each of these springs is connected to a member **41** which is mounted at its ends on small posts **42**, which in turn are secured to the overlapped edge portion **14** of the troweling element **12**. The other ends of these springs are adjustably connected with respect to the outer of the overlapped portions **13** of the troweling element **12**. This connection may be way of a crosspiece **43** to which the springs are attached, the piece **43** in turn having a threaded connection with a thumbscrew member **44**, which is mounted on a bracket **45**. This bracket may be mounted on a piece of arcuately-shaped rubber or rubber-like material **46**. This piece (see FIGS. 5–7) is secured as by a series of screw bolts **47** to the outer overlapped portion **13** of the troweling element **12**, this connection being along a region where the inner overlapped portion **14** of the troweling element is interrupted by an arcuately-extending slot **48**.

The bracket **45** (see FIG. 5) may be secured to the member **46** by two of a series of screw bolts **49**. If wide adjustments may for any reason be desired in the tensioning of springs **40**, then the bracket **45** may be detached and moved arcuately to another position, and then reattached as by use of others of the screws **49**. Bracket **45** may have a guide rod **50**, extending through an aperture in the member **43** for retaining the latter in slidable position.

The member **46** (FIG. 7) may be accompanied on its underside by a plastic guide portion **46'** slidable in the slot **48**. Thus the members **46, 46'**, as secured by screws **47** to the overlapped portion **13** of the troweling element, provide an assembly which is slidable with respect to the slot **48** in the overlapped portion **14** of the troweling element. Portion **46'**, in conjunction with such slot, serves to guide and restrain the relative circumferential movements of the overlapped portions **13** and **14**, preventing any substantial relative movement therebetween in directions axially of the apparatus, while still freely permitting the desired relative movement in circumferential directions under the varying tensions of the springs **40**, resulting when variations may occur in the pressure of

the trailing end portions of the troweling element against the mortar lining. It is desirable that such relative circumferential movements of the overlapped portions of the trowel element be free to take place without binding or jamming of the parts, and to this end various slidably-engageable surfaces at this region are covered with pliable sheets of readily-slipping plastic material, such as known under the trademark "Teflon" or the like, or nylon. For example, referring further to FIGS. 6 and 7, a layer of such material may be interposed at **51** between the overlapped portions **13** and **14**, this layer occurring also partly between the overlapped portion **13** and the piece **46'**. Another such plastic layer may be placed, as at **52**, between the members **46** and **46'**, the outer edges of this layer in turn engaging still other pieces of such plastic free-slipping material at **53** and **54**, located along opposite sides of the slot **48**. The member **46'** may also be made of such material which will freely slide against the adjacent parts.

Thus the slot **48** and the parts slidable adjacent thereto, provide in effect an arcuate tongue-and-groove guide means preventing relative angular displacements of the overlapped portions of the troweling element, while freely permitting relative circumferential movements thereof unrestrained except by the tension of the springs **40** and the counteracting forces of the mortar pressing against the trailing end portions of the trowelling element. The parts of these guide means, it will be noted, are located close to the forward ends of the troweling element and thus spaced quite widely from the trailing end edges, and thus the guide means is free from liability of becoming fouled by cement or foreign matter, particularly since the forward portions of the apparatus are housed within the shroud member **18**.

While the particular example of the adjustable arrangement **17** has hereinabove been described in considerable detail, it will be understood that a variety of mechanical arrangements might alternatively be used for so mounting the springs, such as at **40**, that the tension thereof may be easily adjusted, and so that one end of each is in effect fixed with respect to the overlapped portion **14** of the troweling element **12**, whereas the other ends are fixed with respect to the other overlapped portion, namely portion **13** of the troweling element, and the tension of the springs being such as normally to tend to resist inward compression of the circumference of the forward end portions of the troweling element. Thus normally such forward edge portions will be resiliently held expanded to a proper diameter, such as shown in FIG. 1, and which will normally be substantially less than the interior diameter of the untroweled lining of mortar **11**. Yet the trailing edge portions at **15** of the troweling element will be held expanded to a diameter such as to produce effective troweling action and be flexible with sufficient freedom to exert a uniform troweling pressure against the mortar.

Although a certain particular embodiment of the invention is herein disclosed for purposes of explanation, further modifications thereof, after study of this specification, will be apparent to those skilled in the art to which the invention pertains. Reference should accordingly be had to the appended claims in determining the scope of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. Apparatus for troweling coated interior surfaces of conduits and the like, comprising: a substantially frusto-conically shaped troweling element formed of at least one resilient sheet of material shaped to conform to a cone, the larger and trailing end portions of said element being free resiliently to engage under pressure and to smooth the conduit coating, while the smaller end of said element comprises the leading end thereof, side edge portions of the sheet material being in circumferentially and relatively slidable overlapping rela-

tion; means for mounting the leading end portions of the element while permitting such relative circumferentially slidable relation, said means mounting the leading end portions including a circumferentially extending inner member lending stiffness to said leading end portions; and spring means within said leading end of the element and having opposite ends respectively connected with respect to said edge portions, said spring means being tensioned in a direction tending to slide such overlapping edge portions relative to each other circumferentially of the troweling element in a direction to expand said element, the spring connections including slidable means accompanied by portions restraining such slidable means to movements generally circumferentially of the troweling element.

2. Apparatus for troweling coated interior surfaces of conduits and the like, comprising: a substantially frusto-conically shaped troweling element formed of at least one resilient sheet of material shaped to conform to a cone, the larger and trailing end portions of said element being free resiliently to engage under pressure and to smooth the conduit coating, while the smaller end of said element comprises the leading end thereof, side edge portions of the sheet material being in circumferentially and relatively slidable overlapping relation; means for mounting the leading end portion of the element while permitting such relative circumferentially slidable relation, said means mounting the leading end portions including a circumferentially extending inner member lending stiffness to said leading end portions; and spring means within said leading end of the element and connected with respect to said edge portions for tending to slide such overlapping edge portions relative to each other circumferentially of the troweling element in a direction to expand said element, and relatively slidable portions and parts at the region of the spring connections having their slidable surfaces faced with anti-friction plastic material.

3. Apparatus for troweling coated interior surfaces of conduits and the like, comprising: a substantially frusto-conically shaped troweling element formed of a resilient sheet of material shaped to conform to a cone, the larger and trailing end portions of said element being free resiliently to engage under pressure and to smooth the conduit coating, while the smaller end of said element comprises the leading end thereof, side edge portions of the sheet material being in circumferentially and relatively slidable overlapping relation; means for mounting the leading end portions of the element while permitting such relative circumferentially slidable relation, said means mounting the leading end portions including a circumferentially extending inner member lending stiffness to said leading end portions; annular means firmly secured to and extending around within said leading end of the troweling element for lending firmness thereto, said annular means being interrupted at the region of said overlapping edge portions; and resilient means at the latter region for normally urging said overlapping portions in directions tending slidably to spread same apart to a limited degree.

4. Apparatus for troweling coated interior surfaces of conduits and the like, comprising: a substantially frusto-conically shaped troweling element formed of resilient sheet material shaped to conform to a cone, the larger and trailing end portions of said element being free resiliently to engage under pressure and to smooth the conduit coating, while the smaller end of said element comprises the leading end thereof, side edge portions of the sheet material being in circumferentially and relatively slidable overlapping relation, circumferentially extending inner member lending stiffness to said leading end portions; a plurality of elongated flexible members, each connected at one end to the leading end portions of the troweling element at spaced points around said end portions and extending forwardly in converging relationship; a rigid member adapted for connection to drag means for the apparatus, and to which the forward ends of said elongated members are attached; and a shroud-like member of frusto-conical shape positioned in advance of said leading end portions of the troweling element and connected thereto at spaced points, said shroud-like member having a cone angle substantially greater than that of the troweling element and being also formed of resilient sheet material, with side edge portions of the sheet material in circumferentially and relatively slidable overlapping relation, whereby both said troweling element and the shroud-like member may be yieldably deformed inwardly upon engaging obstructions in the conduit.

References Cited by the Examiner

UNITED STATES PATENTS

126,100	4/1872	Stephens	25—38
635,701	10/1899	Rollins	15—104.18
2,527,083	10/1950	Scott	25—38
2,924,867	2/1960	Perkins	25—38
2,987,794	6/1961	Perkins	25—38
3,188,710	6/1965	Perkins	25—38

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