

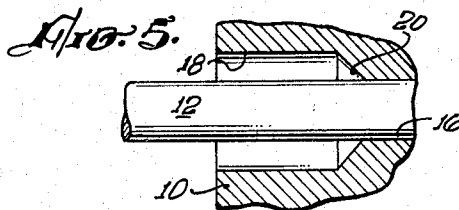
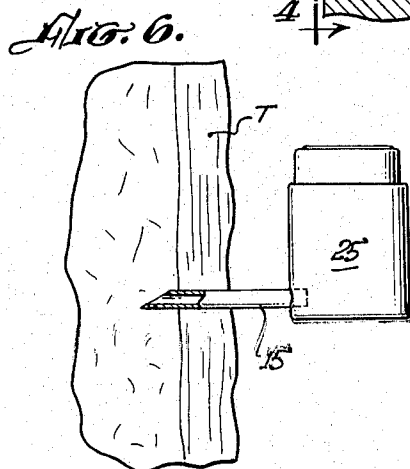
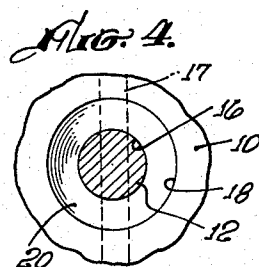
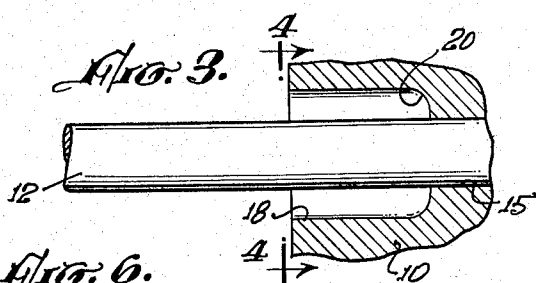
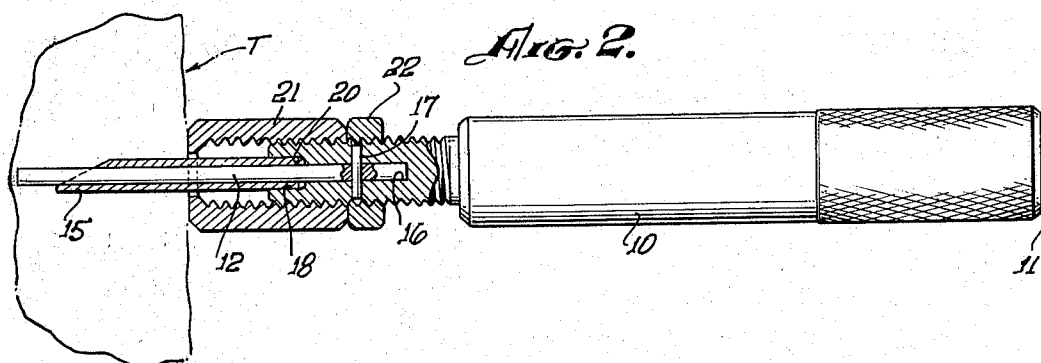
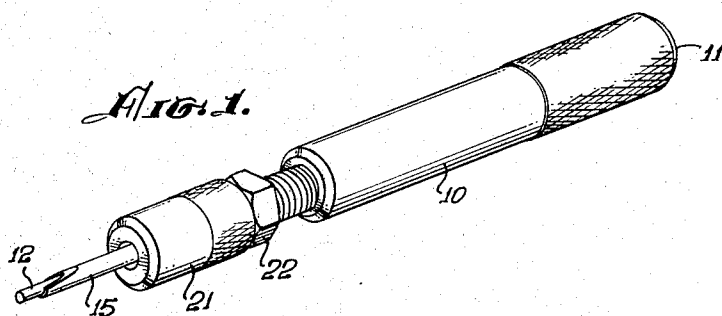
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3,290,822

TOOL FOR SETTING FEEDING TUBES IN PLANTS

Filed July 16, 1964



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3,290,822

TOOL FOR SETTING FEEDING TUBES IN PLANTS

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The present invention relates generally to equipment for administering a liquid to a plant by direct injection into the stem of the plant; and it is more particularly concerned with improvements in a tool for placing a hollow feeding tube, through which the liquid is introduced, in the plant stem.

My Patent No. 2,796,701 issued June 25, 1957, for Tool for Placing Feeding Tubes in Plant Stems discloses tubes and tools of this type and describes their uses. The setting tool is adapted to thrust a hollow feeding tube into the stem of a plant, after which there is attached to the outer end of the tube a reservoir containing a liquid to be administered to the plant.

These feeding tubes are preferably made of aluminum or an aluminum alloy in order to provide an inexpensive tube which, if desired, can be discarded after a single use, but which has sufficient durability to be used several times if desired. The metal has sufficient strength to resist breaking while the tube is set in the plant stem and is also sufficiently inert with respect to the solutions injected into the plants that the tubes do not corrode or rust from weathering. Tubes of this character are normally sharpened at one end, but the outer end of the tube is cut off square, that is, the end surface of the tube lies in a plane normal to the axis of the tube. The necessary force for inserting the tube into the plant stem is applied to this end surface.

While there are many situations, such as in smaller plants, shrubs, bushes, and the like, in which the tube can be set in the plant stem with relatively small effort, either by manually applied force alone or by a few light taps from a hand hammer, there are also situations in which considerable force is applied to the end of the tube in order to set it properly. Thus when tubes are driven into the trunk of a large tree, especially a hardwood tree, it is necessary to apply several moderately heavy hammer blows to the setting tool; and the force of these blows is transmitted directly to the end surface of the tube. It has been discovered that in many instances, as a consequence of driving the tube into a tree, the outer end of the tube is upset or flared from the impact of these blows. The enlarged exterior portion of the tube is inclined to be rough and to have sharp edges. This situation leads to various problems because the reservoirs used in conjunction with the tubes are made of a comparatively soft plastic and are designed to receive the end of the feeding tube with a tight, sliding fit.

If the enlargement of the end of the feeding tube is comparatively small, producing a few sharp fragments of the metal, these metal edges or fragments score the softer plastic and produce minor grooves in the plastic wall which allow the liquid to leak out around the joint between the reservoir and the tube. It is not the economic loss incurred as a result of this leakage which is objectionable as much as it is the danger to personnel from handling the highly potent systemic insecticides which are particularly adapted to injection into plant stems.

If the enlargement of the outer end of the feeding tube is more severe, it makes difficult insertion of the tube into the reservoir and may even reach the point where the outer diameter of the tube is so large that it cannot

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be inserted into the cylindrical passage in the reservoir, thus defeating the object of setting the tube in the tree trunk.

Thus it is a general object of the present invention to provide an improved tool of the character described for setting feeding tubes in plant stems that eliminates or prevents enlargement of the end of the tube under the force applied to the tube to set it in the plant stem.

It is a further object of the invention to provide a tool of the character described for setting a tube in a plant stem that shapes or dresses the end of the tube in a manner to facilitate insertion of the tube into the reservoir and to improve the liquid-tight characteristic of the sliding fit between the tube and the reservoir.

These and other objects are achieved in a setting tool embodying the present invention by providing an elongated tool body adapted to receive hammer blows and having a mandrel secured thereto at one end, the mandrel being insertable into a feeding tube. The body has a cylindrical socket concentric with the mandrel to receive the outer end of the feeding tube, the socket fitting snugly around and engaging the outer surface of the feeding tube to support it in a manner to prevent enlargement of the tube from the driving force directed against the end surface of the tube by the body of the tool. The inner end of the cylindrical socket is preferably provided with a tapered surface which is inclined radially inward away from the tube, said tapered surface being either frusto-conical or arcuate. This tapered surface provides a seat at the end of the socket engaging the end surface of the tube which dresses or shapes the end of the tube in an advantageous manner.

How the above objects and advantages of the present invention are achieved will be better understood by reference to the following description and to the annexed drawing, in which:

FIG. 1 is a perspective view of a setting tool embodying the present invention.

FIG. 2 is an enlarged partial section and side elevation of the improved setting tool.

FIG. 3 is a further enlarged fragmentary median section through the socket receiving the outer end of the feeding tube.

FIG. 4 is a combined elevation and transverse section on line 4—4 of FIG. 3.

FIG. 5 is a fragmentary view similar to FIG. 3 showing a variational form of the seat at the inner end of the cylindrical socket receiving the feeding tube.

FIG. 6 is a combined side elevation and fragmentary section, showing an installation of a feeding tube in a tree trunk with a liquid reservoir mounted on the tube.

Referring now to the drawing, FIG. 1 shows a complete tool with a feeding tube mounted on the mandrel and FIG. 2 shows the forward end of the tool broken away to disclose its construction. From these two figures, it will be seen that the tool comprises an elongated body 10 which serves both as a handle for holding the tool and as a means for receiving hammer blows for driving the feeding tube into the tree. For this purpose, one end face 11 of the body is preferably made flat as a surface to receive the hammer blows.

At the other or forward end of body 10 there is mounted mandrel 12 which is a cylindrical pin, of considerably reduced diameter compared with body 10, the outside diameter of mandrel 12 being such that a feeding tube 15 slides easily upon the mandrel. Mandrel 12 is only slightly less in diameter than the internal diameter of

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feeding tube 15 so that the mandrel acts as a solid core when inserted in the tube that stiffens the tube and prevents it from bending or buckling under the endwise thrust applied to the tube during the operation of setting it into the trunk of the tree T. While the plant in this instance is referred to specifically as a tree since it is chiefly in connection with plants of this character that the tool is designed for use, it will be realized that there is no limitation as to the type of plant with which the setting tool may be used.

Although mandrel 12 may be mounted on the forward end of body 10 in any suitable manner, it is preferable that the body be bored axially at 16 to receive one end of the mandrel, the mandrel being a snug sliding fit in the bore. The mandrel is then retained in the bore by pin 17, although it will be realized that any other suitable means may be used instead.

At its outer end, bore 16 is counterbored as at 18 in order to provide a cylindrical socket concentric with the axis of mandrel 12 into which the inner end of feeding tube 15 is inserted. The inside diameter of counterbore 18 is made substantially equal to the outside diameter of feeding tube 15 in order that the walls of socket 18 engage and support the wall of the tube during the setting operation. Thus, engagement of the tube wall by the tool body at socket 18 confines the walls of the tube and prevents them from being expanded or enlarged during the setting operation.

As will be evident from FIGS. 2 and 3, when tube 15 is within socket 18, it engages a forwardly facing surface on the tool body at the inner end of the socket. This surface 20 constitutes a seat which engages the rear end wall of tube 15 in order to apply to it the endwise directed force required to drive it into the tree trunk. This tube seat 20 may be generally characterized as being inclined inwardly, away from the end of the tube. As shown in FIG. 3, the surface may have a generally arcuate profile, or the profile may be straight as in FIG. 5. In the latter case, the surface is frusto-conical.

The advantage of this inclined surface is that it contacts the end surface of the tube at the rim of the tube where the driving force is concentrated. The result is that any burrs or irregularities in the tube are flattened or are bent inwardly. Any deformation of the tube as a result of the driving force tends to dress or smooth the cut end of the tube, producing a slight bevel or rounding of the rim at the end of the tube. This removes any rough projections which could score the softer plastic reservoir, causing leaks, and also facilitates entry of the tube into the reservoir.

The forward end of body 10 is preferably reduced in diameter and externally threaded to receive stop 21 and lock nut 22 which are both internally threaded. Stop 21 can be moved axially of the body to project beyond the forward end of the body a desired distance by turning it with respect to the body and then held in an adjusted position by tightening lock nut 22 against the rear end of the stop. As will be seen in FIG. 2, stop 21 has an internal bore which is sufficiently large that the stop passes over the outside of feeding tube 15, with considerable clearance, thus not contacting the tube. Since stop 21 is outside of and larger in diameter than tube 15, it engages the outside surface of tree trunk T and thereby limits the penetration of the mandrel and the forward end of tube 15 into the trunk. The depth of penetration of the mandrel and the feeding tube is limited by the position of the stop and likewise the depth can be varied by changing the position of the stop on the body.

As a preliminary to setting the feeding tube, the tube is slipped over the forward end of mandrel 12, as shown in FIGS. 1 and 2. The length of mandrel beyond body 10 is such that the mandrel projects beyond the forward end of the feeding tube for a short distance. For this reason, it is necessary to correlate the length of the

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mandrel and the tube. Likewise the diameter of the mandrel is correlated with the internal diameter of the tube in order to substantially fill and support the tube against bending.

After stop 21 is adjusted to the proper position, the forward end of the mandrel is placed against the trunk T of the tree and the mandrel and tube are then driven into the tree by hammer blows directed against the other end of the body, and particularly on end surface 11. The mandrel and tube are driven into the tree until the front end of stop 21 engages the tree, as in the position of FIG. 2. Then the mandrel is withdrawn, leaving the tube in place in the tree. After withdrawal of the mandrel, a reservoir 25 is slipped over the outer end of the mandrel, as shown in FIG. 6. The reservoir has in one side a cylindrical passage adapted to fit snugly over the outer end of the tube so that the fluid contents of the reservoir can be discharged through the tube into the tree without any danger of leakage. It will thus be appreciated that an important feature of this combination is securing a tight joint between the feeding tube and the reservoir while at the same time in no way damaging the outer end of the feeding tube so that it becomes bent or deformed in a manner that the reservoir cannot be effectively mounted on the end of the feeding tube. This possibility is eliminated by the provision of socket 18 and seat 20 which cooperatively engage the end of the feeding tube during the setting operation to maintain proper size and shape of the surfaces of the tube and prevent any damage thereto from engagement with the driving tool.

From the foregoing description, it will be seen that various changes in the shape, construction, and arrangement of the various parts constituting the present invention may be made by persons skilled in the art without departing from the spirit and scope of the present invention. Accordingly, it is to be understood that the foregoing description is considered as being illustrative of, rather than limitative upon, the invention as defined by the appended claims.

I claim:

1. A tool for setting a feeding tube in the stem of a plant, comprising:

a body adapted to receive hammer blows;
and a mandrel secured to the body and insertable into a feeding tube;
said body having a tapered surface engageable with the end of said tube on the mandrel to deliver axial thrust to said tube.

2. A tool as in claim 1 in which the tapered surface is concentric with the mandrel.

3. A tool as in claim 1 in which the body has a cylindrical socket concentric with the mandrel to receive the end of said tube, the tapered surface being located at the inner end of the socket.

4. A tool for setting a feeding tube in the stem of a plant, comprising:

a body adapted to receive hammer blows;
and a mandrel secured to the body and insertable into a feeding tube;

said body having a cylindrical socket surrounding the mandrel to support the inner end of said tube against enlargement during setting operation, said socket having a frusto-conical surface at the inner end thereof engageable with the end surface of the tube, said frusto-conical surface being inclined radially inwardly away from the end of the feeding tube.

5. A tool for setting a hollow feeding tube in the stem of a plant, comprising:

a body adapted to receive hammer blows;
said body having a tube-receiving cylindrical socket concentric with the mandrel and substantially equal in diameter to the outside of the tube at one end thereof, the inner surface of the socket being smooth and engaging the outside of the feeding tube at said

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one end thereof to transmit endwise thrust thereto and to restrain the tube externally against enlargement by said endwise thrust;
and a mandrel secured to the body and insertable into the feeding tube, said mandrel having slight clearance with the tube to support the tube internally against deformation from said endwise thrust.

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5 ABRAHAM G. STONE, *Primary Examiner*.R. E. BAGWILL, *Assistant Examiner*.