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(54) A SPREADER

(71) We, C. VAN DER LELY N.V., of 10, Weverskade, Maasland, The Netherlands, a Dutch Limited Liability Company, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a spreader for spreading granular and/or powdery material.

According to the present invention there is provided a spreader comprising a frame, a hopper and a spreading member, the hopper having at least one delivery port which is provided with a closure member for adjusting the aperture of the delivery port, the closure member being provided with an actuating mechanism for adjusting the closure member, the actuating mechanism comprising a coupling member which is connected with the closure member and is mounted for pivotal movement with respect to the frame, and a flexible control member which is operable to displace the coupling member relatively to a support which is mounted on the frame, the flexible control member comprising an outer sheath, one end of which is located in the support, and a cable which is displaceable axially within the sheath, one end of the cable projecting from the said one end of the sheath and being connected to the coupling member, a control arm being connected to the other end of the cable for causing relative axial displacement between the cable and the sheath to cause adjustment of the closure member via the coupling member.

An embodiment of the present invention provides a simple, effectively operating spreader in which the actuating mechanism has a simple construction, whilst nevertheless the closure means is readily adjutable to the correct position.

An effectively adjusting actuating mechanism is obtained, when the coupling member comprises a two-armed pivotal lever one arm of which is connected to the operating member and the other arm of which is connected to the closure member. Thus the correct relative positions of the coupling member and the support are ensured.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made by way of example to the accompanying drawings, in which:

Figure 1 is a side elevation of a spreader hitched to a tractor;

Figure 2 is an enlarged plan view of part of the spreader of Figure 1 in a first operative condition;

Figure 3 corresponds to Figure 2, but shows the spreader in a second operative condition;

Figure 4 is a sectional view taken on the line IV-IV in Figure 3; and

Figure 5 corresponds to Figures 2 and 3, but shows the spreader in a third operative condition.

Figure 1 shows a spreader 1 embodying the present invention. The spreader 1 comprises a hopper 2 and a spreading member 3 adapted to rotate about an upwardly extending shaft. The spreader comprises a frame 4 with coupling members 5 and 6 by means of which the spreader is hitched to a lifting device 7 of a tractor 8. The hopper 2 is provided at its lower region with an annular delivery part 11, whose lower side bears, in the embodiment illustrated, on a flat plate 12 of the spreading member 3, which is provided with distribution arms 10 secured to the plate 12. In an alternative construction, not illustrated, the delivery part 11 may be arranged so that it does not bear on the spreading member.

The delivery part 11 has three delivery ports 13, 14 and 15. The delivery part 11 is surrounded by a closure member 16. The closure member 16 comprises a ring 17 extending around the delivery part 11 and having fastened to it closing plates 18, 19 and 20. To the ring 17 is secured an arm 21 holding a spring element including two coils 22 and 23. The free end portions 24 and 25 of the spring engage the delivery part 11. These end portions 24 and 25 are held between guide elements 26 and 27 fastened to

the delivery part 11. The delivery part 11 is provided with tags 28 and 29, to which is fastened a supporting member 30. The supporting member 30 has two arms 31 and 32 disposed in a generally V-shaped fashion, and the ends of these arms 31 and 32 are connected with the tags 28 and 29 in a slightly movable manner. Near the junction of the arms 31 and 32 the supporting member 30 is provided with a tag 33 from which a pin 34 extends upwardly. The pin 34 can be inserted at will into any one of a plurality of holes 35 in a guide 36 fastened to the frame 4 of the device. A spring 37 is connected to the supporting member 30, and has a curved part 38 which bears on the top surface of the guide 36.

To the arm 31 of the supporting member, near the tag 28, is fatened a substantially vertical shaft 41, about which a support in the form of an indicator arm 42 is pivotally mounted. The arm 42 extends from the shaft 41 to a position beyond the arm 32 and has at this end an upwardly bent-over tag 43. Where it crosses the arm 32 the arm 42 has a clamping bolt 44, which passes through a slot 45 in the arm 32. The arm 32 in the region of the slot 45 is arcuate, centred on the shaft 41. The arm 32 has a scale 46 running from 0 to 10. The indicator arm 42 extends a small distance beyond the shaft 41 on the side opposite the arm 32. On this portion of the arm 42 is connected a pivotal shaft 51 at a distance 50 from the shaft 41. A coupling member constituted by a two-armed lever 52 is mounted for pivotal movement about this shaft 51. One arm 53 of the lever 52 is pivotally connected to a strip 54, which in turn is pivotally connected with a tag 55. The tag 55 is rigidly secured to the ring 17 of the closure member 16. The other arm 56 of the lever 52 is connected to one end of an operating member 57, which is coupled at its other end with the tag 43 of the indicator arm 42.

The operating member 57 is a telescopic member comprising a rod 60 which is movably mounted in a tube 68. The rod 60 has a screwthread 61 at one end to receive a connector 62, which is pivotally connected to the end of the arm 56 of the lever 52. The connector 62 is fixed in the desired position on the screwthread by means of a lock-nut 63 provided with a washer 64. The other end 65 of the rod 60 is rigidly secured to the end of an inner cable 66 of a flexible element in the form of a Bowden cable 67. The pipe 68 is clamped by a nut 69 against the end of an externally screwthreaded supporting rod 70. The supporting rod 70 extends through a hole 73 in the tag 43 and is fixed thereto in the desired position by two nuts 71 and 72. The Bowden cable 67 has an outer sheath 74, which is provided at one end with a sleeve 75 which engages the supporting rod 70. The Bowden cable 67 extends from the indicator arm 42 to the tractor 8 and is coupled there with a control arm 76, which is arranged on a support device 77 releasably secured to the tractor 8. The portion of the operating arm located between the tag 43 and the lever 52, and formed by the rod 60, the tube 68 and the supporting rod 70, is surrounded by a flexible boot 78. The boot 78 is shown in Figure 2 over only part of its length.

The spreader operates as follows:

In the condition shown in Figure 2 the ports 13, 14 and 15 are completely closed by the closing plates 18, 19 and 20 of the closure member 16 so that no material can flow from the hopper 2 to the spreading member 3. In this position of the closure member 16 the plate 18 engages the tag 28, which thus constitutes a stop for the closure member in the position in which the delivery ports are closed. The delivery ports 13, 14 and 15 can be opened wholly or partly by turning the closure member 16 in the direction of the arrow 80 around the annular delivery part 11. To effect this, the lever 52 is turned about the shaft 51 in the direction of the arrow 81 (Figure 2). This movement is caused by reducing the length of the operating member 57 acting between the lever 52 and the tag 43. This is done by turning the control-arm 76 to exert a tensile force on the inner cable 66, the rod 60 then moving in the direction of the arrow 82 (Figure 4). In order to fully open the ports 13, 14 and 15, the lever 52 is turned into the position shown in Figure 3. The closing plates 18, 19 and 20 then move into positions in which they are located at the sides of the respective ports 13, 14 and 15. The operating member 57 has its smallest possible length, with the washer 64 engaging the end of the tube 68 and the end 65 of the rod 60 engaging the supporting rod 70. The end 89 of the tube 68 and the end 69 of the supporting rod 70 constitute further stops co-operating with the washer 64 and the rod 60 respectively for defining the degree of opening of the ports 13 to 15. In this condition, the distance 90 between the lever 52 and the support formed by the tag 43 for the operating member 57 is the smallest. This smallest distance 90 can be adjusted by turning the nuts 71 and 72 so that the supporting rod 70 and the tube 68 are shifted relative to the tag 43.

In the conditions shown in Figures 2 and 3 the indicator arm 42 with the indicator 83 is clamped near the number 10 of the scale 46. The number 10 is the highest number on the scale 46 and indicates that the ports 13, 14 and 15 will be fully opened when the operating member 57 is fully retracted.

From the condition shown in Figure 3 the ports 13, 14 and 15 can be closed by exert-

ing through the control-arm 6 on the tractor 8 a pressure on the inner cable 66 so as to move it in a direction opposite the arrow 82. Thus the rod 60 is displaced in the direction opposite the arrow 82 and the lever 52 turns in the direction opposite the arrow 81 about the shaft 51. This movement can be continued until the closing plate 18 engages the tag 28, the ports 13, 14 and 15 being then completely closed.

From the condition shown in Figure 3, the closure member 16 can also be turned in the direction opposite the arrow 80 about the delivery part 11 by turning the indicator arm 42 about the shaft 41. By such a movement of the indicator arm 42 about the shaft 41 in the direction of the arrow 84 the lever 52 is also turned about the shaft 41 and the closure member 16 thus turns in the direction opposite the arrow 80 about the delivery part 11. The indicator arm 42 can be turned through a maximum angle 85 to bring the indicator 83 to zero on the scale 46, the closure member 16 then being turned to an extent such that the closing plate 18 engages the tag 28 and the dosing plates 18, 19 and 20 completely cover the ports 13, 14 and 15. The relative positions of the indicator arm 42 and the lever 52 will not be varied by this movement. In the condition in which the indicator arm 42 is at zero on the scale, the lever 52 can no longer be displaced with respect to the arm 42 by the operating member 57 because the operating member 57 is already fully retracted. Turning of the lever 52 is prevented by the tag 28 and by the stops 89 and 79. In the position of the arm 42 near the zero on the scale 46 the delivery ports 13, 14 and 15 cannot be opened by means of the operating arm 57. The position of the indicator 42 along the scale 46 thus determines the distance over which the plates 18, 19 and 20 can be moved by the operating member 57 in the direction of the arrow 80 for opening the ports wholly or partly.

When the arm 42 with the indicator 83 is set at 5 on the scale, as is shown in Figure 5, the plates 18, 19 and 20 can be turned by means of the member 57 out of the closed state in the direction of the arrow 80 to an extent such that each port 13, 14 and 15 is opened by 5/10th of its overall aperture. Figure 5 shows this position of the indicator arm, when the ports are closed. The distance 91 between the stop 89 and the washer 64 in this position of the indicator arm 42 is such that the closure member can be turned in the direction of the arrow 80 about the delivery portion only to an extent such that the delivery ports 13 to 15 can be only half open by the closing plates 18 to 20. The stop 89 is rigidly secured to the indicator arm 42 forming a support. The indicator arm 42 and hence the stop 89 are displaceable along the arm 32. The indicator arm 42 and hence the stop 89 thus define the displaceability, or range of movement, of the closure member by means of the operating member 57 in order to open the ports 13 to 15 to a greater or lesser extent.

The lengths of the arms 53 and 56 of the lever 52, the distance 50 between the shafts 51 and 41 and the length of the arm 42 are chosen so that the movement of the closing plates 18 to 20 across the delivery ports 13 to 15 in the direction of width 86 of these ports is directly proportional to the position of the arm 42 along the scale 46 from 0 to 10, the position of the arm 42 on the scale indicating the proportion of the apertures of the ports which is uncovered by the closing plates 18 to 20.

Although in the embodiment illustrated the tag 28 acts as an end stop and the end 69 of the tube 68 serves as a further stop for determining the degree of opening the ports 13 to 15, these stops may be set at other places and still perform the same function.

For example, at the end 87 of the indicator arm 42 a stop may be provided to co-operate with the side of the arm 53. This stop will then limit the movement of the lever in the direction of the arrow 81 around the shaft 51 with respect to the arm 42. The length of the tube 68 and that of the rod 60 may then be some what shorter since these parts will no longer need to co-operate with the washer 64 and the supporting rod 70 respectively.

The stop determining the extent of opening of the ports may alternatively be arranged on the control arm 76. This stop must, however, have a fixed location or a fixed relationship relative to the outer sheath of the Bowden cable and hence to the indicator arm 42, so that displacement of the arm 42 involves a change of the maximum distance between the stop connected with the arm 42, for example the stop 79, and its complementary member, for example the washer 64. The closing plates 18 to 20 will remain in the selected position owing to the friction between the various parts. This friction is enhanced by the spring including the coils 22, 23 drawing the plates 18, 19 and 20 against the outer side of the delivery part 11. The part of the actuating mechanism comprising the coupling member 52, the arm 42, the operating member 57 and the control member 67 is fastened to the supporting member 30 and is displaceable on the supporting member with respect to the frame beam 36. Therefore, the closure member 16 and the delivery part 11 can be turned together around the shaft 88 of the spreading member 3. The location of the ports 13, 14 and 15 is thus adjustable so that the direction of distribution of the spreading member can be varied. The pres-

ent invention, however, also includes spreaders in which the closure member joins delivery ports in a part of the hopper which is not displaceable with respect to the frame of the spreader for adjusting the distribution direction of the spreading device.

The present invention is, however, particularly useful for spreaders having a supporting member by which the delivery part of the hopper having one or more delivery ports can be adjusted with respect to the frame for selecting the direction of distribution. The actuating mechanism, one embodiment of which is described above in detail, is very simple and can be actuated readily by means of the Bowden cable. The length of Bowden cable can be chosen at will so that the present invention may be applied to many kinds of spreaders suitable for being hitched in some way or other to a tractor or a similar vehicle.

The operating member 57 may be protected over the part located between the arm 56 and the tag 43 of the arm 42 by a boot shown partly in the sectional view of Figure 4. The various parts inside the boot are effectively protected from dirt or the material to be distributed. The adjustment of the direction of distribution is performed by moving the supporting member to a new position in which it is fixed by inserting the pin 34 into a hole of the guide 36. The tag 33 can ge pushed down against the force of the spring 38 so that the pin 34 can be taken out of one hole 35 and be inserted into a further hole 35. The pin 34 is held in the selected hole by the pressure of the spring 38 which tends to move the tag 33 upwards with respect to the guide 36.

WHAT WE CLAIM IS:—

1. A spreader comprising a frame, a hopper and a spreading member, the hopper having at least one delivery port which is provided with a closure member for adjusting the aperture of the delivery port, the closure member being provided with an actuating mechanism for adjusting the closure member, the actuating mechanism comprising a coupling member which is connected with the closure member and is mounted for pivotal movement with respect to the frame, and a flexible control member which is operable to displace the coupling member relatively to a support which is mounted on the frame, the flexible control member comprising an outer sheath, one end of which is located in the support, and a cable which is displaceable axially within the sheath, one end of the cable projecting from the said one end of the sheath and being connected to the coupling member, a control arm being connected to the other end of the cable for causing relative axial displacement between the cable and the sheath to cause adjustment of the closure member via the coupling member.

2. A spreader as claimed in claim 1, in which the cable is connected to the coupling member by a rod which is axially movable within a tube which is mounted on the support.

3. A spreader as claimed in claim 2, in which the tube is rigidly connected to the support and the rod is pivotably connected with the coupling member.

4. A spreader as claimed in claim 2 or 3, in which the tube is connected to the support adjustably in the lengthwise direction of the tube.

5. A spreader as claimed in claim 4, in which the tube is connected to a supporting rod which is adjustably mounted on the support.

6. A spreader as claimed in claim 5, in which the supporting rod has an axial bore through which the cable extends.

7. A spreader as claimed in claim 5 or 6, in which the outer sheath is in engagement with that end of the supporting rod which is opposite the end at which the tube is connected.

8. A spreader as claimed in any one of the preceding claims, in which the coupling member comprises a two-armed pivotal lever, one arm of the lever being connected to the cable and the other arm being connected to the closure member.

9. A spreader as claimed in any one of the preceding claims, in which the two-armed lever is mounted on the support.

10. A spreader as claimed in claim 9, in which the support is mounted on the frame for pivotal movement about an axis which is disposed between the respective points of connection of the two-armed lever and of the said one end of the sheath to the support.

11. A spreader as claimed in any one of the preceding claims, in which a stop is provided for engagement with the closure member when the or each delivery port is fully closed.

12. A spreader as claimed in any one of the preceding claims, in which a further stop is provided for engagement with the closure member to limit the maximum aperture of the or each delivery port.

13. A spreader as claimed in claim 12, in which the further stop is adjustable relative to the frame so that the maximum aperture of the or each delivery port is adjustable.

14. A spreader as claimed in claim 13, in which the further stop is coupled with the support.

15. A spreader as claimed in claim 13 or 14, in which the support comprises an indicator arm which is pivotally mounted on the frame and is fixable in any one of a plurality of positions with respect to the frame in

order to determine the position of the further stop.

16. A spreader as claimed in any one of the preceding claims, in which the support is mounted on a supporting member which is connected to the delivery part of the hopper and is adjustable relative to the frame.

17. A spreader as claimed in claim 16, in which the supporting member has two arms and in which the support is pivotally coupled with one arm of the supporting member and is pivotable along the other arm of the supporting member, to which other arm the support can be fixed in any one of a plurality of positions, the said other arm of the supporting member being provided with a scale for gauging the position of the support.

18. A spreader as claimed in any one of the preceding claims, in which the control arm is arranged on a support device which is adapted to be releasably connected to a tractor or a similar vehicle to which the spreader is connectible.

19. A spreader as claimed in any one of the preceding claims, in which the coupling member and/or the support are pivotable relative to the frame about upwardly extending pivotal axes.

20. A spreader substantially as described herein with reference to and as shown in the accompanying drawings.

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Sheet 1

FIG.1

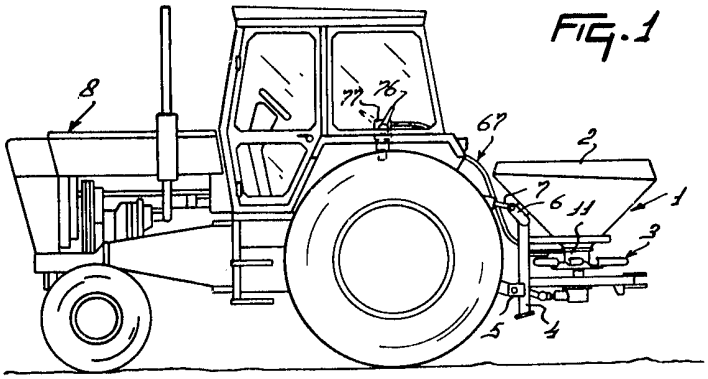
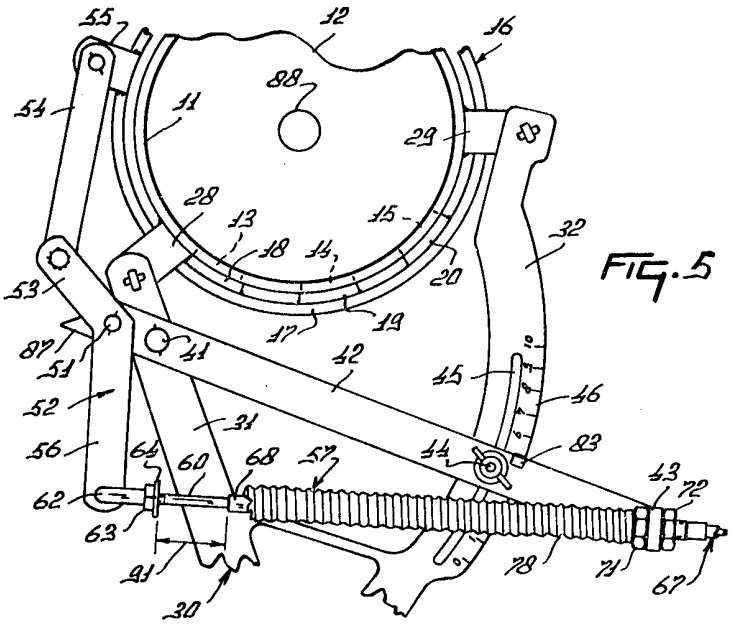


FIG.5



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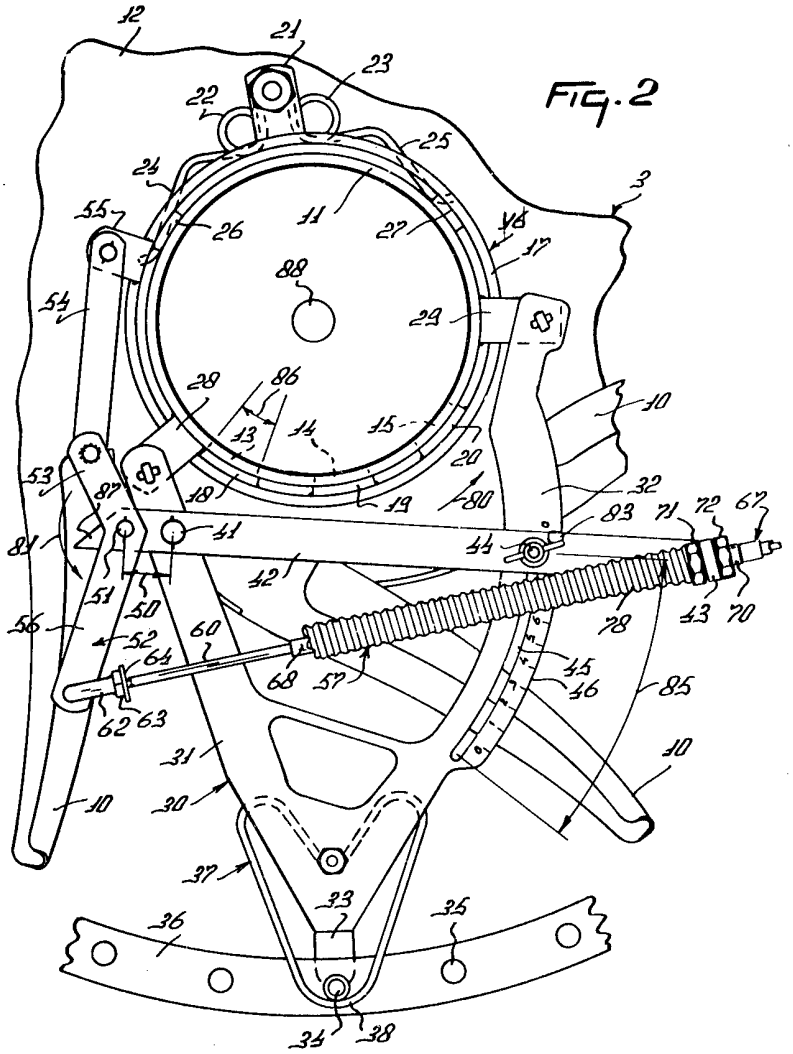

FIG. 2

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Sheet 3

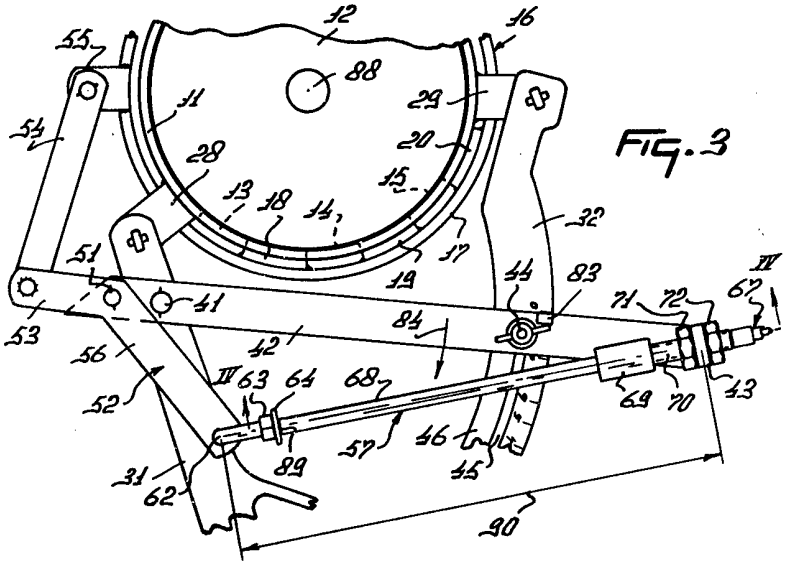

FIG. 3

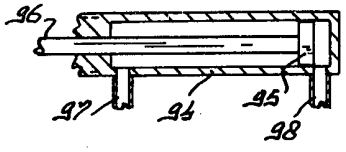

FIG. 6

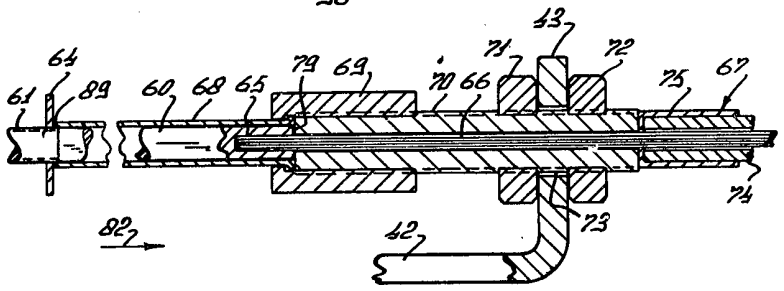

FIG. 4