Dec. 10, 1968 H. H. SCHMIDGALL 3,415,482

FORM FOR MAKING CONCRETE PIPE WITH WALL OPENINGS

Filed Nov. 9, 1966

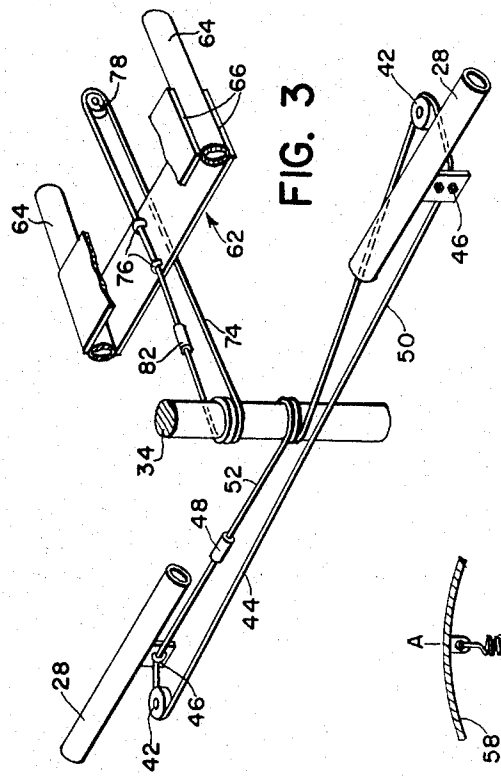

FIG. 3

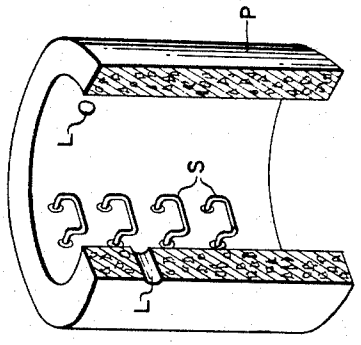

FIG. 5

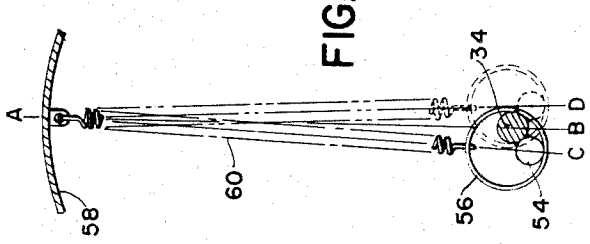

FIG. 4

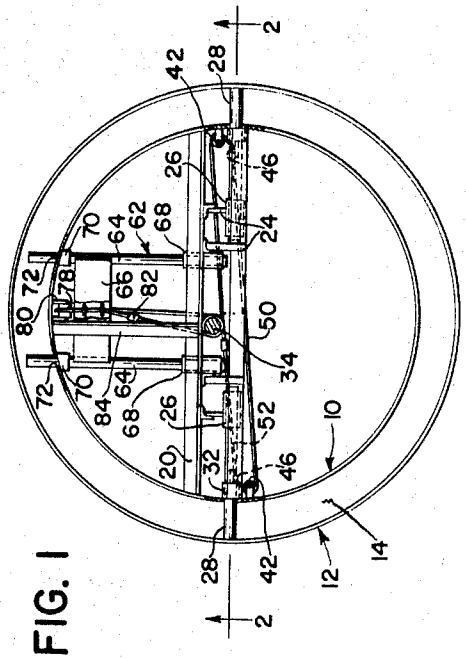

FIG. 1

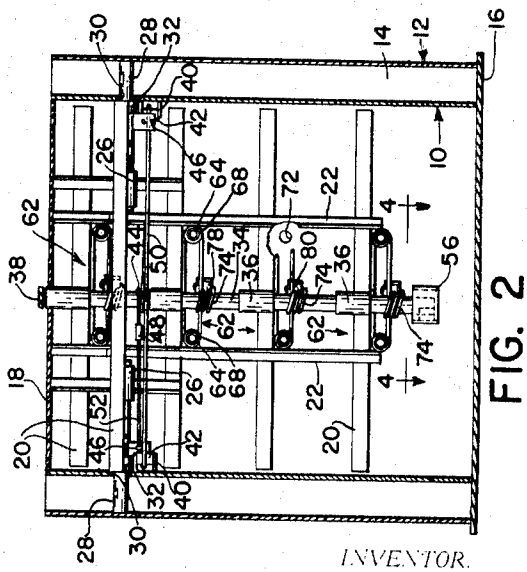

FIG. 2

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FORM FOR MAKING CONCRETE PIPE WITH WALL OPENINGS

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This invention relates to a form for making concrete pipe and the like and improves the form by providing therein selectively projectible and retractible means for forming one or more holes in the wall of the pipe during the casting or forming process.

The core of the form is hollow and has one or more holes in its wall through which one or more hole-forming elements may be projected from within the core and into the annular space between the core and its surrounding jacket. Operating means is provided for projecting the element or elements before concrete is poured into the space and for retracting the element or elements after the concrete has set up sufficiently to enable the form to be stripped away from the finished pipe. Holes thus provided in the pipe may be used for internally mounting step rungs and the like as well as for facilitating handling of the pipe.

It is known, of course, to provide for such holes in the casting of pipe, but the methods heretofore employed require individual, externally manipulated plugs and the like, which must be withdrawn individually or driven individually inwardly to drop within the hollow core from which they must be retrieved later.

It is accordingly a significant object of the present invention to provide an improved form having the hole-forming elements permanently mounted interiorly of the core and gauged for selective projection and retraction in unison. It is a further object to gauge a plurality of sets of such elements for forming recesses or pockets in the pipe wall in which several step rungs may be subsequently mounted. A further object is to provide a pair of diametrically opposed elements that, when projected, extend entirely across the space between the core and jacket so as to provide a pair of through-holes in the pipe wall for facilitating handling of the pipe in transport and installation. Another object is to provide releasable means for selectively retaining the hole-forming elements in projected or retracted positions. And a further object is to provide simple operating means employing a rockshaft and cable and pulley means for projecting and retracting the elements.

Further objects and features will become apparent to those versed in the art as a preferred embodiment of the invention is disclosed, by way of example, in the ensuing description and accompanying drawing, wherein:

FIGURE 1 is a plan of the form, with its top removed and parts shown in section;

FIGURE 2 is a section on the line 2—2 of FIGURE 1;

FIGURE 3 is a schematic perspective of the operating mechanism and certain of the hole-forming elements;

FIGURE 4 is an enlarged section on the line 4—4 of FIGURE 2; and

FIGURE 5 is a perspective, with portions broken away and shown in section, illustrating a typical concrete pipe section.

Since most concrete pipe is of circular section, the form shown and described here, for making pipe sections such as P (FIGURE 5), takes that shape, but this is for illustration only and does not exclude the applicability of the invention to other cross-sections, such as square, oval, truncated conical etc.

The form here conventionally includes a central, hollow, steel core **10** (here cylindrical) and a concentric surrounding steel jacket **12**, the two being arranged to provide a typical annular space **14** in which the concrete is poured. The core and jacket rest at their bottoms on a base plate **16**, usually supported on the floor, ground, etc., and the top of the core is closed by a welded-in circular top plate **18**, which has been removed in FIGURE 1 to expose the interior support and operating means, etc.

The support means comprises a plurality of metal cross bars **20**, generally diametrically of the core, and a plurality of upright metal bars **22**, together with appropriate braces, straps, etc. as at **24**, all of which may be rigidly mounted within the core as by welding, the weld areas, since they are obvious, being omitted in the interests of brevity and clarity.

An upper crossbar **20** rigidly carries a pair of diametrically coaxial sleeve bearings **26**, and each of these slidably carries a hole-forming element **28**. The respective wall portions of the core **10** have diametric holes **30** through which the elements **28** can project into the annular space **14**. The associated core wall portions rigidly carry coaxial sleeve bearings **32** for the elements **28**. An upright rockshaft **34** is carried in a plurality of crossbar-mounted sleeve bearings **36**, and the top of this rockshaft projects through a suitable aperture in the core top plate **18** and has coaxially rigidly affixed thereto a hexagon wrench-receiving head **38**.

Diametrically opposed wall portions of the core, respectively adjacent to the bearings **32**, carry brackets **40**, each of which journals a roller or pulley **42**. A flexible element such as a cable **44** has a few turns wrapped around the rockshaft **34** and extends around the pulleys **42** and has opposing run portions **50** and **52** (FIGURE 3) clamped, as by U-bolts **46**, to respective depending ears on the elements **28**. The ends of the cable are spliced together in any suitable manner as at **48** (FIGURE 3). When the rockshaft **34** is turned in a clockwise direction, the cable portion **50** will be tightened as it is pulled around the right-hand pulley **32**, drawing the right-hand element **28** to the right or in the direction of projection into the space **14** and at the same time pulling the cable portion **52** around the other pulley **32** to project the other element **28** into the space **14**. Counterclockwise rocking of the rockshaft **34** simultaneously retracts the elements **28** from the space **14**.

The lower end of the rockshaft **34** has rigid thereon a lug or cam **54** (FIGURE 4) which is surrounded by a metal ring **56** that is resiliently drawn toward the radially opposite core wall portion **58** by a tension spring **60**. A line AB from the core wall portion **58** through the center of the rockshaft **34** represents dead center. When the rockshaft is turned to its position to project the elements **28**, the lug **54** passes to the left of this line and the line of force exerted by the spring is AC, an over-center locking position. At this time the outer ends of the elements **28** abut the interior wall of the jacket **12**. When the rockshaft is turned counterclockwise to retract the elements **25**, the line of force is AD, overcenter to the other side. Thus the rockshaft is releasably or resiliently locked in either over-center position, preventing inadvertent changes in position, especially when projected and during vibration of the form to settle the concrete.

The elements **28** when projected completely span the space **14**, i.e., each element extends from the core **10** to the jacket **12**, which means that after the concrete has been poured into the space **14** and sets up, and the elements **28** are retracted, which of course enables axial stripping of the core from the pipe, the finished pipe P will have therein a pair of diametrically opposed through-holes L (FIGURE 5) known in the art as "lay" holes, by means of which the pipe may be more easily

handled in transport and installation. Such holes are later closed by grout or the like.

It is known to provide concrete pipe, especially upper "manhole" sections, with metal rod-like step rungs, as at S (FIGURE 5) and to add these to the finished pipe by inserting the bent rung hooks into pre-formed holes in the pipe and securing the rungs by adding group or the like to the holes. According to the present invention, suhc rung holes (or recesses here, since they need not be through-holes, as will appear) may be formed simultaneously with the "lay" holes and by similar elements arranged in similar sets spaced apart lengthwise (here vertically) of the pipe form **10–12** and arranged normal to the elements **28**. In the present case, four such element sets **62** are provided.

Each set **62** comprises a pair of parallel recess-forming elements **64** rigidly joined by cross plates **66** and arranged to slide back and forth along a path transverse or normal to that of the elements **28**, this being accomplished by sleeve bearings **68** welded to the bars **20** and **22** and respectively alined sleeve bearings **70** welded to core wall portions in which alined holes **72** (FIGURE 1) are provided so that the elements **64** may be projected into and retracted from the space **14**. Note that the projected elements (FIGURE 1) stop short of the jacket **12**, so that recesses or pockets rather than throughholes are formed in the pipe. This leaves the outer surface of the pipe smooth and unbroken.

Each set **62** of elements **64** is projected and retracted by means of a cable **74** wrapped around the rockshaft **34**, clamped to a cross plate **66** at **76** and trained about a roller or pulley **78** carried by the proximate portion of the core wall on a bracket **80**. The ends of the cable **74** may be spliced together at **82**, and braces **84** may extend between the core wall and cross bars **20** to add strength. The cable arrangements **74** etc. are the same for all element sets **62** so that the sets project and retract in unison. The lock means (FIGURE 4) functions of course as before.

The mechanism is simple and is mounted wholly within the core, yet is easily operable via the head **38** from outside the form. Since the elements **28** and element sets **62** operate in unison, the manufacture of concrete pipe of the type referred to is simplified and made less expensive. Other features and advantages will occur to those versed in the art, as will many modifications and alterations in the preferred embodiment disclosed, all without departure from the spirit and scope of the invention.

What is claimed is:

1. In a concrete pipe making form including a hollow core surrounded by a jacket to provide between the core and jacket an annular space for receiving concrete, the improvement comprising supporting means within the core, a hole-forming element disposed within the core

in transverse relation to the core axis, said core including a wall portion having an opening therethrough in alinement with said element, means mounting said element on the support means for selective projection through said hole and into the concrete-receiving space and for retraction from said space, and operating shaft means extending lengthwise of the core and rockably carried by the support means and operatively connected to and for selectively projecting and retracting said element.

2. The invention defined in claim **1** in which said wall portion includes a bearing in which said element is carried.

3. The invention defined in claim **1**, including releasable locking means operative to releasably hold the element when projected.

4. The invention defined in claim **1**, including releasable locking means operative to releasably hold the element when projected and retracted.

5. The invention defined in claim **1**, including a second element similarly mounted and connected to the operating shaft means for projection and retraction, said core wall having an additional hole alined with and accommodating said second element.

6. The invention defined in claim **5**, in which said second element is parallel to the first-named element.

7. The invention defined in claim **5**, in which said second element is transverse to the first-named element.

8. The invention defined in claim **1**, including a second element parallel to the first-named element and similarly mounted and connected to the operating shaft means for projection and retraction in unison with said first-named element to provide a first set of paired elements, and a plurality of similar sets of paired elements similarly mounted and connected to the operating shaft means for projection and retraction of all sets in unison, said core wall having holes respectively alined with and for accommodating all elements.

9. The invention defined in claim **8**, including further elements mounted on the support means in transverse relation to the aforesaid sets and connected to the operating shaft means for projection and retraction with said sets, said core wall having further holes respectively alined with and accommodating said further elements.

10. The invention defined in claim **1** including cable and pulley means connected among said operating shaft means and the element.

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