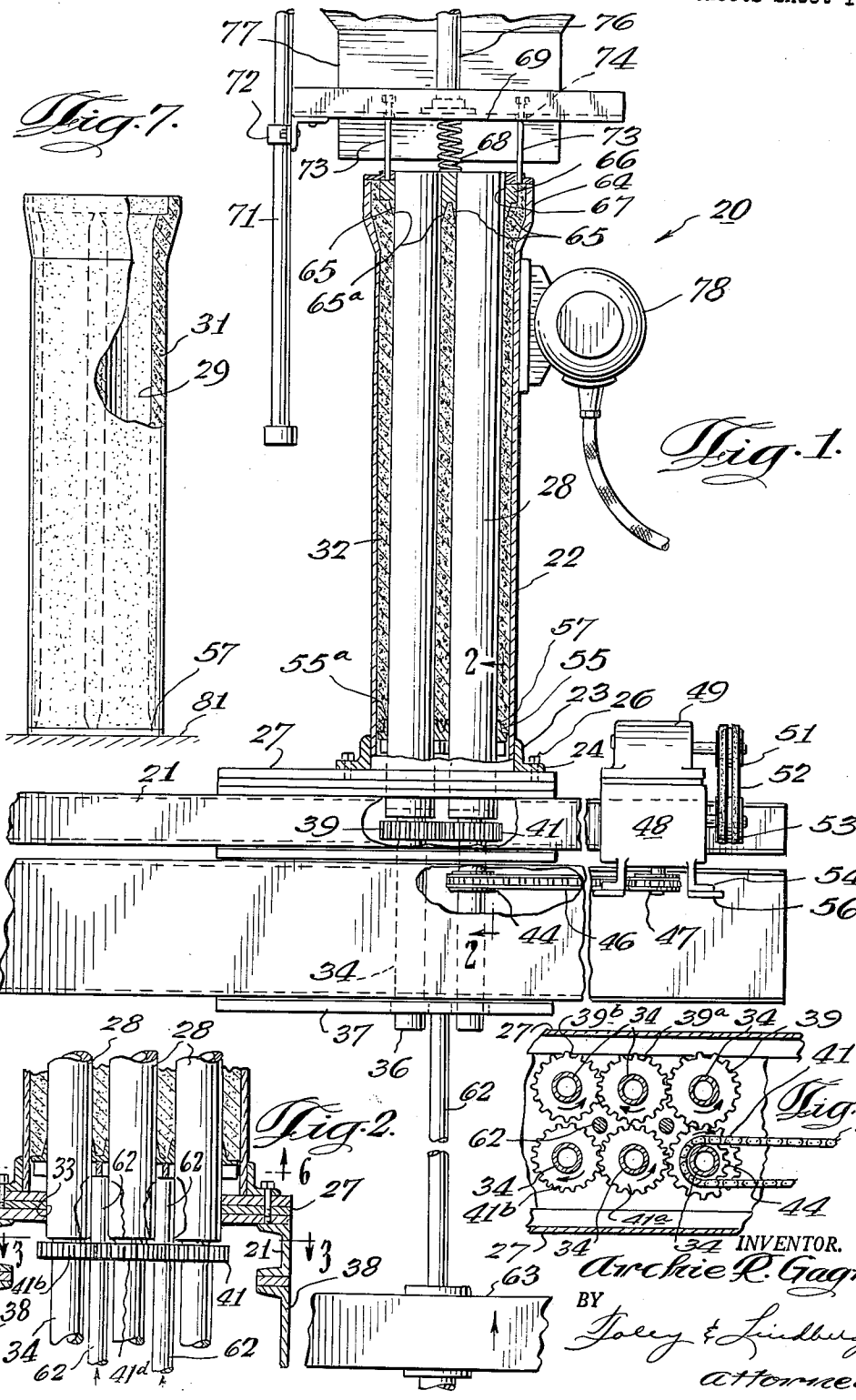
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MACHINE FOR MAKING CONCRETE CONDUIT

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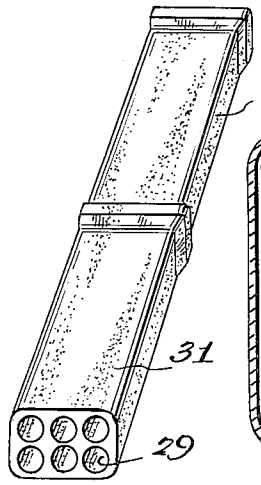

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Fig. 9.



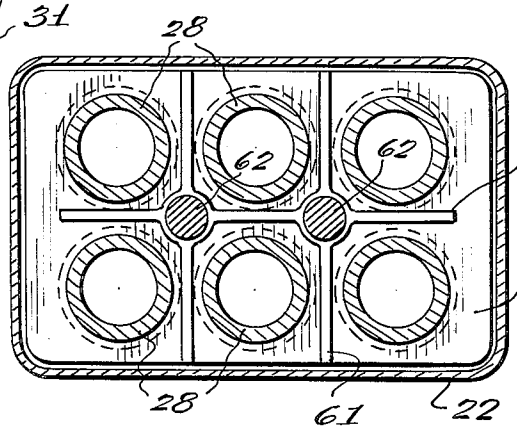




Fig. 6.

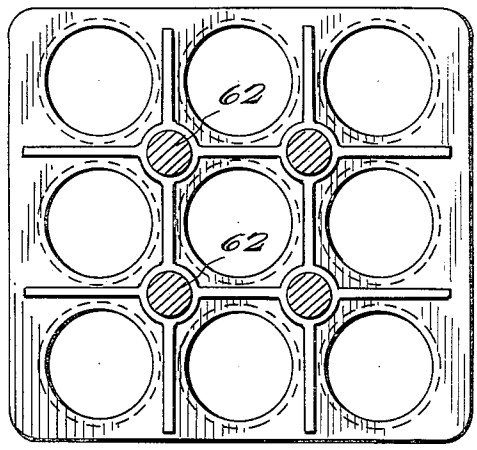



Fig. 10.

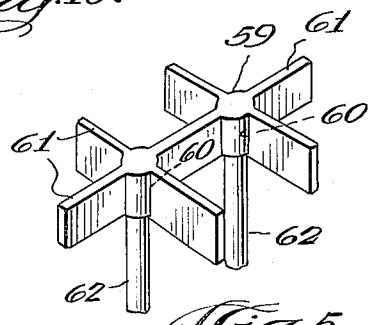
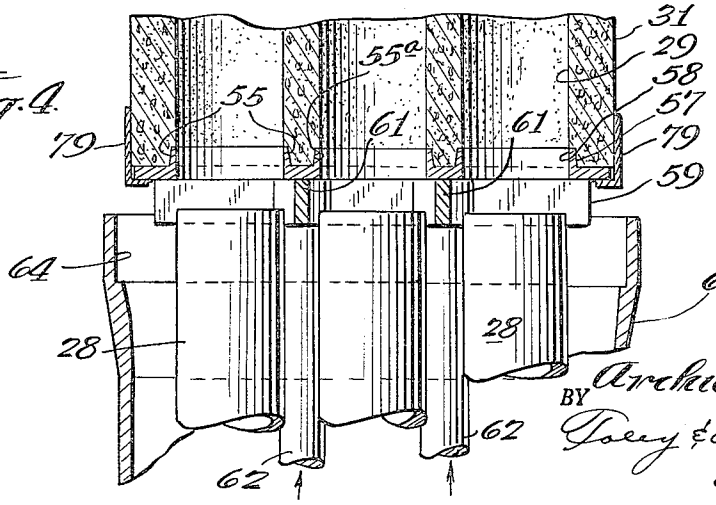



Fig. 5.

Fig. 4.




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Fig. 11.

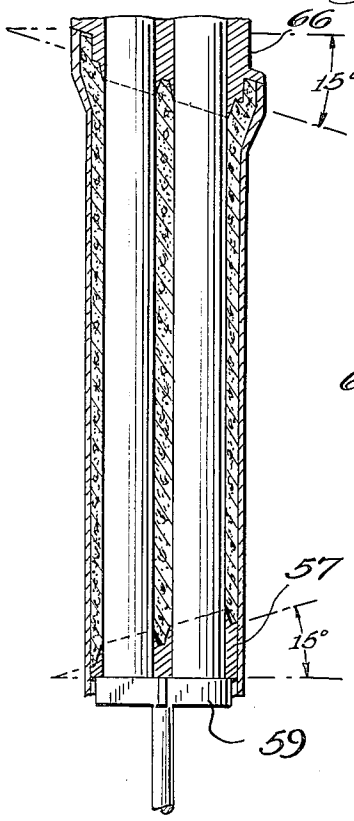
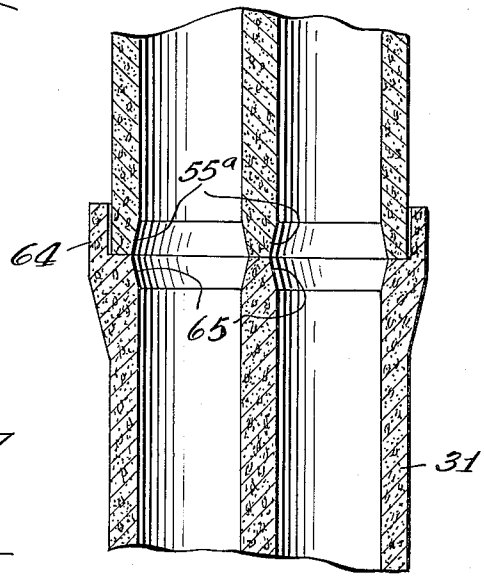



Fig. 8.



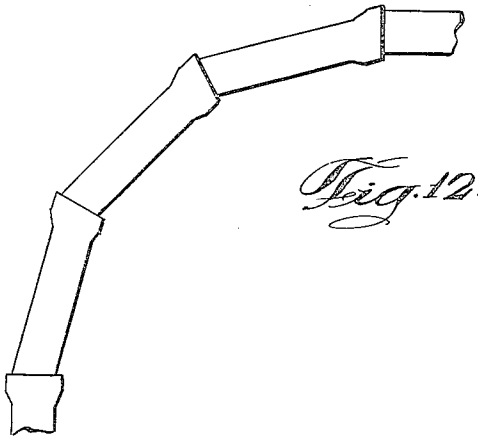



Fig. 12.

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# MACHINE FOR MAKING CONCRETE CONDUIT

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5 Claims. (Cl. 25—33)

This invention relates generally to machines for making concrete conduit and more particularly to an improved machine for making multi-duct concrete conduit such as may be employed for protecting underground telephone cables.

According to the present invention, the multi-duct conduit is formed in a mold having a plurality of rotating mandrels therein all driven from a common driving point, and the number of which is varied according to the number of ducts in the finished piece of conduit. The mandrels pass through a lower pressure pallet or platen having circular openings therein according to the number of the mandrels forming the ducts, and this lower pressure pallet has bearing against the bottom thereof a load transmitting spider with arms clearing the rotating mandrels, the spider coooperating with push rods disposed between four of the rotating mandrels and operable by a crosshead to extrude a finished piece from the mold. The top of the mold is provided with a pressure platen having openings corresponding to the rotating mandrels, which during the molding process pass therethrough. The upper pressure platen is subjected to a compacting load through a spring and crosshead, the spring enabling the mold to be vibrated to increase the compaction of the concrete.

In one form of practicing the invention the pressure platens are formed in such a fashion as to provide a miter on the ends of the finished conduit so that the conduit may be readily laid along a curve of a radius which is shorter than by "pulling" the spigot end in the bell end of the conduit.

In the practice of the invention the pressure platens have frustro-conical sleeves surrounding the mandrels so as to provide smooth conical transition surfaces between the ducts of each pipe.

With the foregoing considerations in mind it is a principal object of this invention to provide an improved apparatus for forming multi-duct conduit, said apparatus being characterized by ready adjusted to form conduit having a different number of ducts therein.

Other objects and important features of the invention will be apparent from a study of the specification following taken with the drawings which together describe and illustrate a preferred embodiment of the invention, and what is now considered to be the best mode of practicing the principles thereof. Other embodiments may be suggested to those having the benefit of the teachings herein and such other embodiments are intended to be reserved especially as they fall within the scope and spirit of the subjoined claims.

In the drawings:

FIG. 1 is an elevational view of a machine according to the present invention for making multi-duct conduit, certain parts thereof being shown in section;

FIG. 2 is a detailed elevational view, certain parts being shown in section, taken substantially along the plane 2—2 of FIG. 1, looking in the direction of the arrows;

FIG. 3 is a section taken along the line 3—3 of FIG. 2 looking in the direction of the arrows;

FIG. 4 is an enlarged elevational view showing the conduit being extruded from the mold after being formed therein as seen in FIG. 1;

FIG. 5 is a perspective view of a pressure transmitting



spider for extruding the pressure conduit from the mold seen in FIG. 1;

FIG. 6 is a section taken along the line 6—6 of FIG. 2 looking in the direction of the arrows showing further details of the spider seen in FIG. 5 and its relationship to the mold seen in FIG. 1;

FIG. 7 is an elevational view of a finished length of conduit formed by the machine seen with reference to FIGS. 1 to 6 inclusive;

FIG. 8 is a longitudinal section through the bell and spigot joint between two contiguous pipes showing the conical transition surfaces between the ducts;

FIG. 9 is a perspective view showing how lengths of conduit can be disposed in end to end relationship;

FIG. 10 is a view similar to FIG. 6, but showing a pressure transmitting spider for use in making a multi-duct conduit having nine ducts therein instead of six as seen with reference to FIGS. 1 to 6 inclusive;

FIG. 11 is a longitudinal section through a finished length of conduit showing how the pressure platens may be modified so as to provide mitred ends on the conduit; and

FIGURE 12 shows the conduits having mitred ends arranged in a curve.

Referring now particularly to FIG. 1 of the drawings, the improved machine for forming multi-ducted conduit is referred to generally by the reference numeral 20 and includes a deck 21 for supporting a hollow mold 22 of rectangular shape and having base angles 23, the legs 24 of which are secured by cap screws 26 to a pad 27 resting upon the deck 21.

The hollow mold 22 has a plurality of rotating mandrels 28 extending longitudinally thereof and arranged to form a plurality of ducts 29 in a finished length of conduit 31, see also FIG. 7. The interior of the mold 22 is accordingly filled with a concrete mixture 32, and by reason of the rotation of the mandrels 28 the ducts 29 have what can be considered as a dense trowel-like finish.

The mandrels 28, see FIG. 2, are journaled as at 33 in the pad 27, and have hollow extensions 34 of smaller diameter journaled in end caps 36 supported in a plate 37 spanning the distance between a pair of spaced channel members 38, 38, see also FIG. 2.

As seen in FIG. 3, a pair of opposite extensions 34 have fast thereto meshing gears 39 and 41. A driving chain sprocket 44 is fast upon the extension 34 supporting the driving pinion 41. A sprocket chain 46 is trained around the sprocket 44, said sprocket chain 46 being also trained around a driving sprocket 47 of a speed reducer 48 mounted upon the spaced channel members 38. The speed reducer 48 includes a driving motor 49 therefor, with a driving pulley 51 connected by a V-belt drive 52 to a driven pulley 53 of the speed reducer 48.

As seen in FIG. 1 the speed reducer has feet 54 supported upon members 56 extending between the spaced channel members 38.

Referring again to FIG. 3, the driving pinion 39 also meshes with a driven pinion 39*a* in turn meshing with a driven pinion 39*b*, each being fast upon its respective extension 34. Driving pinion 41 meshes with an idler pinion 41*a*, idler pinion 41*a* in turn meshing with an idler pinion 41*b*, the two idler pinions 41*a* and 41*b* being fast to their respective extensions 34. The teeth of idler pinions 39*a* and 39*b* are arranged to clear the teeth of the idler pinion 41*a* and 41*b*, as seen in FIG. 3, to avoid the necessity of close tolerances in locating the centers of the extensions 34 supporting the idler pinions 39*a*, 39*b*, 41*a* and 41*b*.

A lower pressure platen or pallet 57, see also FIG. 4, has openings 58 therein corresponding to the spacing of the rotating mandrels 28. The dimensions of the platen 57 corresponds to the interior dimension of the mold 22

as seen in FIG. 1. Each opening 58 has an externally tapered sleeve 55 welded thereat so as to give a corresponding slight taper or chamfer 55*a* at the end of the duct 29.

The pressure platen 57 rests upon a spider 59, see also FIG. 5, having arms 61 extending between the spaced rotating mandrels 28. The spider 59 is urged against the lower side of the lower pressure platen 57 by means of pressure transmitting rods 62, see also FIG. 3, which move together with the spider 61 and the pressure platen 57 longitudinally of the mold 22, under conditions as will be described, and on a longitudinal axis coincident with the point of intersection of the diagonals of four contiguous mandrels 28. The upper end of each pressure rod 62 fits within a socket 60 in the spider 61.

The pressure transmitting rods 62 are connected at their lower ends to a crosshead 63 which can be raised and lowered by any convenient means, preferably hydraulic cylinders, not shown.

The upper end of the mold 22 is belled as at 64 and the belled end is closed by an upper pressure platen 66 having openings 67 therein for the rotating mandrels 28. Each opening 67 has an external tapered sleeve 65 welded thereat so as to give a corresponding slight taper or chamfer 65*a* at the bell end of duct 29.

As seen in FIG. 8 when the spigot end is inserted into bell 64 the tapered surfaces 55*a* and 65*a* provide a smooth transition from one duct to another. This is especially important to protect lead sheathed cable when it is "snaked" through the duct 29.

Pressure is exerted against the upper pressure platen 66 by means of a coil spring 68 the lower end of which abuts the pressure platen 66, and the upper end of which abuts a crosshead 69. The crosshead 69 is suitably guided at one end by a guide rod 71, the end of the crosshead 69 having a guide 72 thereon cooperating with the guide rod 71. The upper pressure platen 66 is suspended from the crosshead 69 by means of long cap screws 73 threaded thereinto and passing through openings 74 in the crosshead 69. A pressure transmitting rod 76, preferably part of an hydraulic cylinder and piston system imposes pressure against the platen 66 through the medium of the spring 68.

A hopper 77 is provided to supply concrete mixture to the mold 22 and a form vibrator indicated generally by the reference numeral 78 is secured to the outer side of the mold 22.

It is thought that the operation of the machine is apparent from the description foregoing. In loading the machine the upper pressure platen 66 is moved from the bell end 64 of the mold 22 and a charge of concrete mixture is admitted to the mold 22 with the mandrels 28, and the lower pressure platen 57 and the pressure applying spider 59 also in the position seen in FIG. 1. When the fresh charge of concrete mixture has been placed in the mold the crosshead 69, together with the upper pressure platen 66, is moved to the position shown, pressure being applied by the upper pressure transmitting rod 76 and the lower pressure transmitting rod 62 connected to the lower crosshead 63, while the mass 32 within the mold 22, is vibrated by the form vibrator 78.

After a suitable time of compaction the upper crosshead 69, together with the upper pressure platen is raised by the rod 76. The lower crosshead 63 then raises the pressure transmitting spider 59 together with the lower pressure platen 57 to extrude a molded and compacted article from the mold 22. When the molded and compacted article has been raised to a position as seen in FIG. 4 the tines 79 of any lifting and transporting device can engage the lower face of the lower pressure platen 57, and the finished product 31 can then be stored in vertical position for curing upon any suitable platform 81, after removal of the tines 79.

After curing, the lower pressure platen 57 is removed and cleaned and oiled for subsequent reuse. The so-cured conduit can then be laid as seen in FIG. 9 with a spigot end inserted into a bell end in a manner well known in the art.

Referring to FIG. 10 of the drawings, there is shown another form of a lower pressure platen and a pressure transmitting spider for use in forming conduit having nine duct openings therein. It may be noted that in this form of the invention, there would be another train of driving pinions for the extra mandrels required, the master pinion of such train meshing with either the pinion 39 or pinion 41, the idler pinions meshing with such driving pinion being constructed like the idler pinions 39*a*, 39*b*, 41*a* and 41*b*. In such form of the invention where nine ducts would be provided in each molded length, the pusher rods 62 would lie at the intersections of the diagonals connecting the turning centers of four contiguous mandrels thereby providing four such pusher rods. In such other form of the invention the pusher rod 62 would clear the drive gearing for the rotating mandrels, if drive gearing is employed. It is entirely within the scope of the invention to rock the mandrels by any suitable crank and drag-link arrangement.

Referring now to FIGS. 11 and 12, there is shown an alternate form for both the lower and upper pressure platens 57 and 66. In these forms the plane of platens against the concrete mixture is inclined at an angle to the longitudinal axis of the duct, and in the example given the angle between the upper and lower planes of the platen may be of the order of 15° as shown. The arrangement shown gives a 15° miter at the ends of the conduit so that they can be laid in a curve as seen in FIG. 12. Where a 15° miter is provided with 36" lengths of conduit they may be laid on a curve having a ten foot radius.

In cases where 4, 6, 8 or 9 or any other even number of ducts are employed, more than two, are to be provided in a molded length of conduit, the pusher rods would be constructed so as to move on an axis corresponding to the point of intersection of the described diagonals.

It will be observed that any length of conduit less than the length of the mold may be made by initially raising the bottom pressure platen to any desired position. Selection of shorter lengths may be indicated where weight considerations are important.

Concrete conduit constructed by apparatus according to the present invention has achieved a seven day strength of as much as 6000 pounds, and a density as high as 167 pounds, both extremely high values.

While the invention has been described in terms of a preferred embodiment thereof its scope is intended to be limited only by the claims here appended.

I claim as my invention:

1. In a machine of the class described for making multi-duct conduit, a deck having an opening therein, a mold secured to said deck over said opening, a plurality of rotating mandrels extending through said opening and lengthwise of said mold, upper and lower pressure platens having openings therein for said rotating mandrels, means for applying pressure to said upper and lower pressure platens while said mandrels are rotating comprising a loaded crosshead with spring means interposed between said crosshead and said upper platen, a pressure transmitting spider bearing against the underside of said lower pressure platen and having arms extending between said rotating mandrels, a pressure transmitting member extending longitudinally of said mandrels and having its axis coincident with the point of intersection of the diagonals of four contiguous mandrels, and means for vibrating said mold whereby said upper and lower pressure platens will compact a concrete mass therebetween.

2. In a machine of the class described for making multi-duct conduit, a deck having an opening therein, a mold secured to said deck over said opening, a plurality of mandrels extending through said opening and lengthwise

of said mold, upper and lower pressure platens having openings therein to receive said mandrels and closely fitting the same, said mandrels extending through said openings, means for applying pressure to said upper and lower pressure platens comprising a loaded crosshead with resilient means interposed between said crosshead and said upper platen, a pressure transmitting spider bearing against the underside of said lower pressure platen and having arms extending between said mandrels, a pressure transmitting member extending longitudinally of said mandrels and therebetween and having its axis coincident with the point of intersection of the diagonals of four contiguous mandrels, and frusto-conical shaped extensions from said upper and lower pressure platens at the openings therein and extending inward of said mold and adapted to encircle said mandrels at the respective upper and lower ends thereof, said extensions providing chamfers at the ends of the ducts formed by said mandrels, the frusto-conical extensions from said lower pressure platen being guided along their respective mandrels during the expressing of said conduit from said mold to maintain the aforesaid chamfers at the lower end of said conduit both during and at the completion of expressing the conduit from said mold.

3. In a machine of the class described for making multi-duct conduit, a deck having an opening, a mold secured to said deck over said opening, a plurality of mandrels extending through said opening and lengthwise of said mold, upper and lower pressure platens having openings therein to receive said mandrels and closely fitting the same, said mandrels extending through said openings, means for applying pressure to said upper and lower pressure platens comprising a loaded crosshead with resilient means interposed between said crosshead and said upper platen, frustro-conical shaped extensions from said upper and lower pressure platens at the openings therein and extending inward of said mold and adapted to encircle said mandrels at the respective upper and lower ends thereof, said extensions providing chamfers at the ends of the ducts formed by said mandrels, a pressure transmitting spider bearing against the underside of said lower pressure platen and having arms extending between said mandrels, a pressure transmitting member extending longitudinally of said mandrels and between the same, and means for moving said loaded crosshead away from said mold prior to the expressing of a compacted length of conduit from said mold, the frustro-conical shaped extensions from said lower pressure platen being guided along their respective mandrels during the expressing of said conduit from said mold to maintain the chamfers in the lower end of said conduit both during and at the completion of expressing the conduit from said mold.

4. In a machine of the class described for making



multi-duct conduit, a deck having an opening therein, a mold secured to said deck over said opening, a plurality of mandrels extending through said opening and lengthwise of said mold, upper and lower pressure platens having openings therein to receive said mandrels and closely fitting the same, said mandrels extending through said openings, means for applying pressure to said upper and lower pressure platens comprising a loaded crosshead with spring means interposed between said crosshead and said upper platen, a pressure transmitting spider bearing against the underside of said lower pressure platen, a pressure transmitting member extending longitudinally of said mandrels, frustro-conical shaped extensions from said upper and lower pressure platens at the openings therein and extending inward of said mold and adapted to encircle said mandrels at the respective upper and lower ends thereof, said extensions providing chamfers at the ends of the ducts formed by said mandrels, and means for moving said loaded crosshead away from said mold prior to the expressing of a compacted length of conduit therefrom, the compacted length of conduit in said mold being moved therefrom by said lower pressure platen and said pressure transmitting spider, said lower platen being separable from said spider and providing a base for supporting a removed length of conduit, the frustro-conical extensions from said lower pressure platen being guided along their respective mandrels during the expressing of said conduit from said mold to maintain the chamfers in the lower end of said conduit both during and at the completion of expressing conduit from said mold.

5. The structure of claim 4 wherein said upper and lower pressure platens have surfaces inclined at an angle to the longitudinal axis of the mold whereby the ends of the conduit formed in the mold are mitered.


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