PROCESS FOR FABRICATING SCREENS

Filed Feb. 12, 1960

FIG. 1

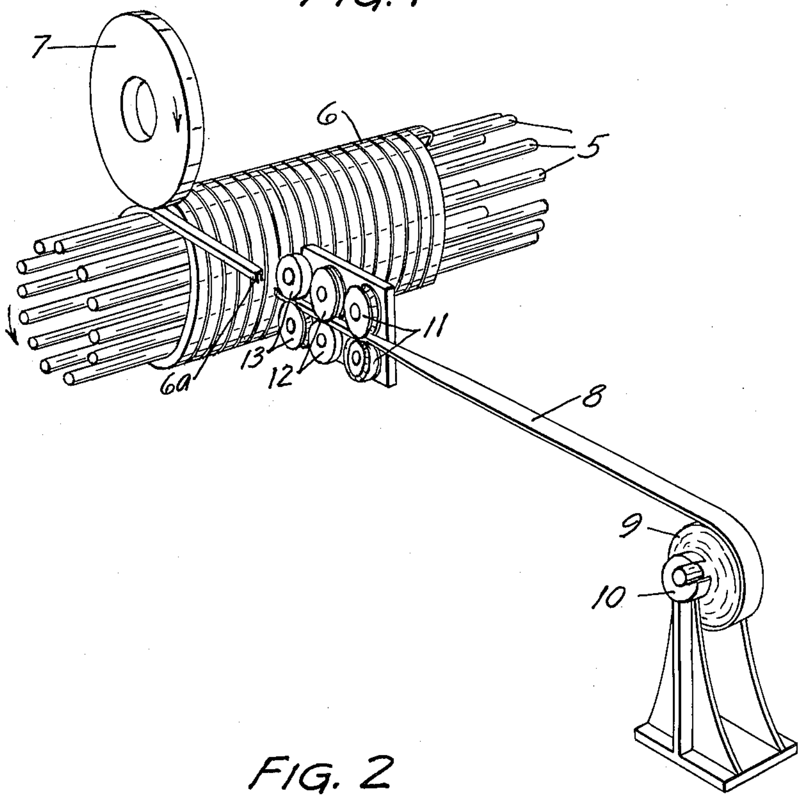


FIG. 2

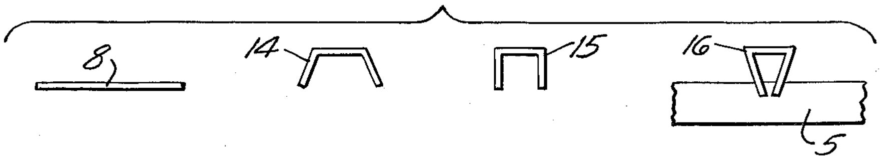


FIG. 3

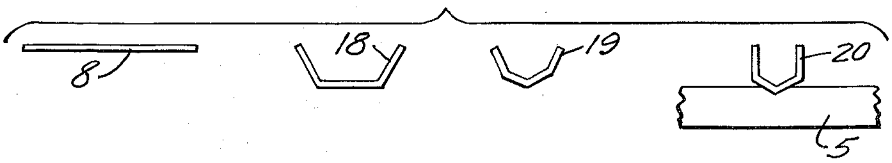
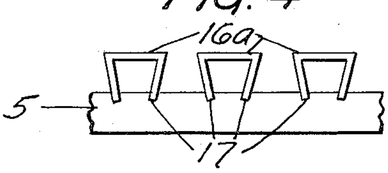


FIG. 4



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1

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PROCESS FOR FABRICATING SCREENS

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This invention relates to an improved process for fabricating screens and particularly to the making of screens of substantially cylindrical or flat form and of the general type described in Johnson Patents No. 2,046,458, 2,046,459, 2,046,460 and 2,046,461 granted July 7, 1936. Our process is an improvement over the process for fabricating screens described in Johnson Patent No. 2,046,461.

These patents relate particularly to well screens which must be provided in a wide variety of diameters, lengths, slot widths and various sizes of longitudinal and circumferential members. In general, modern well screens are of cylindrical shape and comprise a multiplicity of longitudinally extending rods held in spaced parallel relation by a wrap wire the convolutions of which are joined to the several rods at each crossing point by welded joints. The spacing of adjacent turns of wire determines the slot widths which must be held uniformly within small tolerances for efficient performance. Geological formations from which ground water supplies are obtained vary so such that every well tapping these formations presents an individual problem. This is especially true when the water is obtained from sand and gravel formations which constitute the most abundant and dependable sources of well water.

A successful screen must let sand-free water flow into the well in ample quantity and with minimum loss of head to supply the pump at full capacity. Thus, each screen should have slots of the proper width to prevent the passage of the sand or gravel in a particular well. Slots may be required of widths anywhere within a range of .006 inch to .25 inch or more. Other elements being properly designed, the well screen determines the capacity of the well, the draw down and pumping head, freedom from sand, and general efficiency of performance.

Screen diameters range from approximately 1½ inch to 36 inches. Adequate resistance to longitudinal forces presents no problem and the required range of such resistances may be readily provided by selecting longitudinal members of suitable size and suitably spaced around the circumference of the screen. It is more difficult, however, to provide the required wide range of resistance to lateral forces tending to collapse the cylinder. The lateral resistance to collapse is a function of the thickness, form and spacing of the circumferential members.

Heretofore well screen manufacturers have at large expense maintained large inventories of wrap wire to enable them to fabricate individual screens which meet all specifications within a wide range of wire sizes and shapes.

It is an object of our invention to provide a novel integrated process for fabricating a screen of the class described from a substantially cylindrical inner unit of conventional type and a thin, relatively wide strip of sheet material which is fed from a reel and given the required cross sectional shape by a continuous forming operation, then wrapped around and secured to the circular array of longitudinal rods forming the inner unit, the latter being held in conventional manner, rotated about its axis, and advanced longitudinally to space the convolutions of the wire along the inner unit.

There are circumstances in which a screen unit is used with the flow in the direction from the inside to the outside rather than the conventional flow from the outside to

2

the inside. Wire sections to meet any such variations in requirements may be readily formed according to the present invention ranging from the conventional one to a section which provides a slot of V-shape in cross section which widens from the inner toward the outer side.

The invention will be best understood by reference to the accompanying drawing in which:

FIGURE 1 is a schematic illustration of apparatus for carrying out the process;

FIG. 2 shows successive cross sectional shapes of the wrap wire strip resulting from the first, second and third passes through the forming rolls whereby the screen is designed for flow from the outside to the inside;

FIG. 3 shows the cross sectional shape of the wrap wire produced by the successive passes through the forming rolls for a screen of the type wherein flow is from the inside to the outside, and

FIG. 4 illustrates a modified form of wire which may be produced by slight modification of the forming rolls for the third pass, a plurality of convolutions being shown welded to a rod of the cylindrical inner unit.

Referring to FIG. 1, a group of rods **5** constituting an inner, substantially cylindrical, unit are shown as they are held in conventional manner during the winding of a wrap wire **6** of helical form on the exterior of the rods **5**. Also, in accordance with conventional procedure, the wrap wire is secured by weld joints at the several points of crossing the rods **5** and current for the welding operation may be supplied through a welding roll **7** shown in contact with the wire **6** where the latter extends tangentially to the group of rods **5**, a tangential reach of wire being indicated at *6a*.

According to our invention the wire **6** is formed continuously in timed relation to the rotation of the rods **5** from a thin, relatively wide continuous strip **8** of any desired weldable material. The strip **8** is fed from a coil **9** supported on a bracket **10** and passes continuously to pairs of forming rolls indicated respectively by the numerals **11**, **12** and **13**. The forming rolls **11**, **12** and **13** may be of conventional type, each pair having coacting tongue and groove or otherwise modified peripheries adapted to impart the required shape to the strip. Thus, as indicated in FIG. 2, the rolls **11** of the first pass may bend the marginal portions of the strip **8** to form a channel section **14**, the rolls **12** of the second pass may produce the section indicated at **15** and the rolls **13** of the third pass may produce a triangular finished wire section **16** which is thereupon welded to the wires **5** or other cylindrical inner unit.

Other examples of suitable formations for the strip **8** are illustrated in FIGS. 3 and 4. As shown in FIG. 4, a modification of the third pass rolls **13** may be provided to form a channel shape section having spaced longitudinally extending edges **17**, both of which may be welded to the rods **5** or other inner unit.

As indicated in FIG. 3, the wrap wire may be designed to permit flow from the inside to the outside. For such a modification the rolls of first pass may be adapted to produce a section **18**, those of the second pass to modify this section to that indicated at **19** and the final or third pass rolls to form the substantially U-shaped section shown at **20**. In this case the marginal portions of the strip **8** project outwardly from the central portion which is welded to the rods **5** or other tubular supporting member.

As will be evident from the foregoing, our improved process involves essentially the feeding of a wide relatively thin strip of material from a roll of such material for forming the wrap wire, bending marginal portions of the strip to form a wire of the desired shape and continuously, without interrupting the feeding and forming of the wire, securing the wire to the several rods or other tubular inner unit by electric welding, while rotating the inner unit about its axis and advancing it longitudnally to space the convolutions of the wire along the unit. The same forming operation may include the step of bringing the sides of the wire together to provide a wrap wire of suitable tubular form.

Large savings in the cost of maintaining inventiories are effected by the use of our process due to the fact that the strip material required for the manufacture of a large range of screens may consist of rolls of strip material of suitable gauges. Such rolls may be slit longitudinally to provide strips of the width required for any particular screen as a part of the continuous or integrated forming process. Thus a single convenient width of rolled sheet material of the desired gauge may be slit longitudinally to provide any required width while the remaining sheet material may be rewound on another roll for future slitting.

By a simple variation of strip width and adjustment of the forming rolls, both the width of the section and the depth of it may be modified to provide a wrap wire of any required size and shape. The slot opening for any particular screen can be formed as a continuous helix, according to conventional practice, but our improved process permits fabrication of units with a given resistance to collapse for different widths of the slot openings. This will be understood when it is considered that when fixed dimension sections of the prior art are used, the resistance to collapse is reduced as the width of the slot opening is increased. Heretofore, it has been necessary to select from stock sizes of wire an available size which comes closest to providing the resistance to collapse required for each screen. According to our process, however, the width and depth of the wrap wire section can be modified so that optimum properties are obtained merely by selection of a suitable strip width and set of forming rolls for producing the required wire section.

Suitable flat strip and sheet materials for use in construction of our improved well screen are known to the art and are commonly corrosion-resistant metals and alloys including stainless and other corrosion-resistant steels, bronzes and brasses. It may be desirable for some installations to provide a tubular wrap wire with a suitable plastic core, e.g., a polyester resin or an asbestos wick or jute wick as a filler for the hollow wire. This affords added resistance to deformation, at low cost, such a core being suitable for incorporation in the wire simultaneously with the forming of a screen unit. Instead of a cylindrical group of rods 5, the inner tubular unit to receive the wrap wire may comprise a foraminous tubular unit adapted

to be rotated and advanced longitudinally during the forming and feeding of the wrap wire.

The economic advantages of our invention may be summarized as follows: (1) Reduction in the amount of metal required to produce a unit of given specifications, thus saving metal and reducing cost; (2) Simplicity of stock requirements and savings in capital investment resulting from the substitution of a few gauges of standard flat stock at low cost per pound for multiple stock of special shapes and high cost per pound; (3) Reduction in the weight of the product, resulting in reduction in the cost of handling and shipping of the product, and (4) An optimum combination of strength and cost for any required condition of service.

We claim:

1. A continuous process for making a tubular unit of the class described which comprises, rotating a substantially cylindrical group of longitudinally extending rods about its axis; simultaneously feeding a thin continuous strip of material adapted to be joined by heat fusion to said rods; simultaneously bending longitudinally extending side portions of said strip by a continuous operation to form an open-sided channel having continuous, spaced longitudinally extending side portions; continuously feeding said channel substantially tangentially to said group of rods with both of the open side edges of said side portions in contact with the rods; and continuously, without interrupting the feeding and bending of said strip, securing said side portions of said channel shaped strip at the open side thereof to the exterior surface of said group of rods by electric welding, while rotating said group of rods as a unit about its axis and advancing it longitudinally to space the convolutions of said channel shaped member along said unit.

2. A process in accordance with claim 1 in which said marginal portions of the strip are bent to extend at an acute angle one to the other.

3. A process in accordance with claim 2 in which the bending of said strip is continued until a tubular wire of substantially triangular shape in cross section is formed.

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