March 15, 1966 W. E. BIXBY 3,240,237

METHOD FOR MAKING SCREEN

Original Filed Aug. 10, 1961

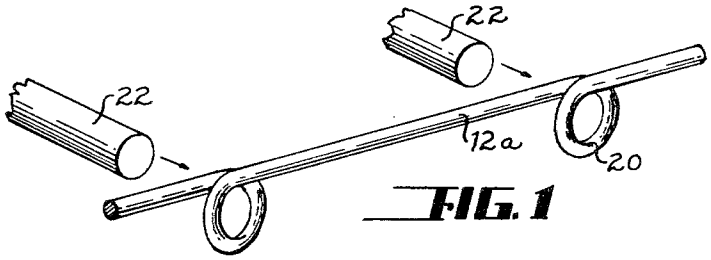

FIG. 1

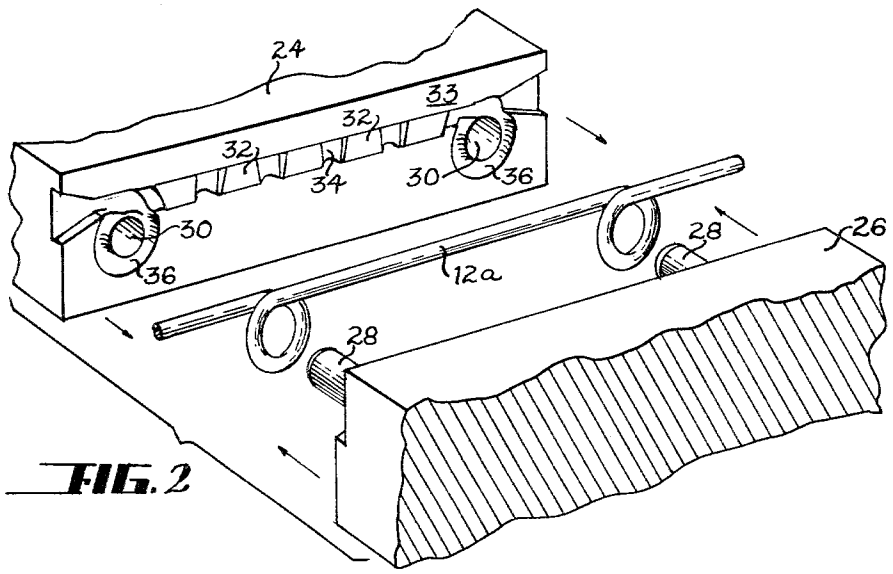

FIG. 2

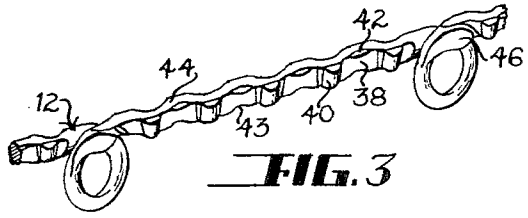

FIG. 3

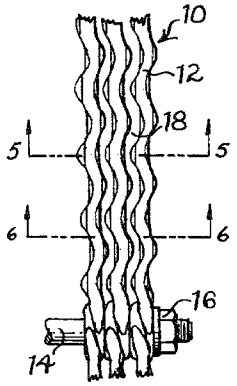

FIG. 4

FIG. 5

FIG. 6

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METHOD FOR MAKING SCREEN

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Original application Aug. 10, 1961, Ser. No. 130,559, now Patent No. 3,116,239, dated Dec. 31, 1963. Divided and this application Sept. 11, 1963, Ser. No. 308,149
4 Claims. (Cl. 140—71)

The present application is a division of my copending application Serial No. 130,559, now Patent No. 3,116,239 filed August 10, 1961, for Screen.

This invention relates to a method for making screen assemblies and more particularly to a method for making a marcelled screen assembly suitable for use in dewatering operations carried out in the mining industry, however, the invention is not necessarily so limited.

A screen assembly of the type herein described typically comprises one or more screen sections mounted on a support, each section including a plurality of generally parallel metallic wire elements of narrow width and relatively great length supported by spaced parallel cross bars. The wires are spaced one from the other so as to permit the passage of liquids, dust and small particles of predetermined size through the screen. The individual screen sections may be of any suitable size, a common size being eight feet in length and approximately three feet in width. Often the support for the screen is a vibratory support which shakes the screen and thereby aids in the screening operation. These screens and uses to which they are put are well known in the art.

In operations involving screens of this type, a particular problem is encountered when the material passing over the screen includes slivers or platelets as well as generally round or cubical particles. This problem arises from the fact that the earlier screens contained elongated linear slots between the generally parallel wire elements. Platelets or slivers of comparatively large area could pass freely through these slots and in most operations the passage of these comparatively large particles through the screen is objectionable.

In order to alleviate this problem, attempts have been made to form protuberances on the parallel wire elements at spaced intervals, which protuberances would provide localized obstructions in the slots between the wire elements to prevent the passage of oversized slivers or platelets through the screen. For reasons of economy of manufacture, the material forming the protuberances was forced out of the wires in a forming operation. This type of screen was not favorably accepted in the trade for two principal reasons, one being that this type of construction reduces the open area in the screen and the other being that this type of construction is effective only in screens having a comparatively small slot width (one millimeter or less). For large slot widths, the protuberances, which were limited in size due to the fact that they were taken from the wire, had little effect on the passage of slivers or platelets through the screen. Within the limited range of opening sizes in which the protuberances were effective, the passage of platelets through the screens is generally of minor importance, the problem with platelets being most prominent where the screen opening size exceeds one millimeter.

An object of the present invention is to provide a new and improved screen of the type described, wherein the parallel wire elements which form the screen surfaces are sinuously curved or marcelled, so as to restrict the passage of large slivers or platelets through the screen without limiting the open area of the screen.

Another object of the present invention is to provide a

new and improved method for fabricating sinuous wire elements useful in screens of the type described.

Other objects and advantages reside in the construction of parts, the combination thereof, the method of manufacture and the mode of operation, as will become more apparent from the following description.

In the drawing:

FIGURE 1 is a fragmentary exploded perspective view illustrating a partially formed wire element employed in the screen of the present invention;

FIGURE 2 is another fragmentary exploded perspective view illustrating a coining operation performed on the partially formed wire elements of FIGURE 1;

FIGURE 3 is a fragmentary perspective view illustrating the wire element after coining according to FIGURE 2;

FIGURE 4 is a fragmentary plan view illustrating a portion of the screen of the present invention;

FIGURE 5 is a fragmentary sectional view, taken substantially along the line 5—5 of FIGURE 4;

FIGURE 6 is a fragmentary sectional view, taken substantially along the line 6—6 of FIGURE 4.

Referring to the drawing in greater detail, FIGURE 4 illustrates a portion of a screen **10** formed according to the present invention. This screen comprises a plurality of generally parallel wire elements **12**, each of which is looped about spaced support rods **14**. Only one of the support rods **14** is illustrated in FIGURE 4. These wire elements are secured in fixed relation by means of nuts **16** threadedly engaging the ends of the support rods **14**.

It is to be understood that FIGURE 4 illustrates only a small portion of the screen which, as previously mentioned, may comprise a section eight feet in length and approximately three feet in width, the support rods **14** being spaced at approximate three-inch intervals along the length of the screen.

As clearly appears in FIGURE 4, each of the wire elements **12** is sinuously undulated in a direction transverse to its length. In the assembled screen, the undulations occupy substantially a common plane, the adjacent wire elements being nested together, so as to form sinuous slots **18** therebetween. These slots **18** each have a substantially constant width throughout the distance between adjacent support rods **14**.

In the manufacture of the present screen, it is found impractical to form sinuous undulations in the wire elements **12** prior to the time these wire elements are looped for engagement with the support rods **14**. Thus, existing machinery for looping the wire elements requires straight wire elements of uniform cross section. It is therefore advantageous in the formation of the present screen to first loop the wire and then produce the sinuous undulations in the wire. The method for forming the wire elements **12** is illustrated in FIGURES 1 and 2.

FIGURE 1 illustrates a length of wire **12***a* of circular cross section which has been looped at spaced intervals to form loops **20** therein, these loops being substantially coplanar. Methods and apparatus for looping the wire element **12***a* are well established in the art and form no part of the present invention. Ordinarily, spindles **22**, as shown in FIGURE 1, engage the loops **20** to maintain a fixed spacing between these loops.

After the wire **12***a* has been looped, it is passed between a pair of coining dies **24**, **26**, as shown in FIGURE 2. The die **26** is provided with spindles **28** which replace the spindles **22** of the looping machine. The die **24** is provided with apertures **30** to receive the spindles **28**, thus enabling the dies to move into close operative relationship.

Disposed between the apertures **30** and the die **24** are a plurality of coining punches **32** having generally trap-

ezoidal working faces and arranged in a linear array. The spaces 34 between the coining punches are recessed away from the working faces of the coining punches to receive metal displaced from the wire elements during the coining operation, as will be more fully described subsequently. At the working face, each coining punch 32 slopes inwardly of the die 24 as it moves upwardly, establishing a shoulder 33 overlying the coining punches. The die 26 has a similar array of coining punches adapted to fit under the shoulder 33 as the dies 24, 26 coact. In the die 26, the coining punches have a shape similar to that of the coining punches 32, but are staggered relative to the coining punches 32, such that the coining punches in the die 26 are directly opposite the recesses 34 in the die 24.

FIGURE 3 illustrates a wire element 12 formed by compressing the wire element 12*a* between the coining dies 24, 26. As can be observed, this wire element has spaced indentations or flats 38 along the sides thereof formed by the coining punches in the coining dies, the indentations on one side of the wire element being staggered relative to the indentations on the other side of the wire element.

Between the indentations on each side of the wire element are protuberances 40 produced by the displacement of material from the wire elements, which is guided into the recesses 34 of the coining dies due to the shape of the coining dies.

Due to the aforementioned slope in the working faces of the coining punches 32 in each of the dies 24, 26, the opposing working faces diverge from bottom to top. Thus, when the dies 24, 26 coact, the wire element 12*a* is wedged upwardly by the working faces of the coining punches. The wire element 12*a* is therefore forced against the under surface of the shoulder 33 on the coining die 24, producing a flat upper surface 44 on the completed wire element 12. The dimples 42 and 43 which appear on the upper and lower surfaces, respectively, of the wire element represent surface portions of the original wire element 12*a* which were not directly engaged by portions of the coining dies.

Surrounding each aperture 30 in the die 24 and each spindle 28 in the die 26 is an annular recess 36 which permits the dies to coact without exerting pressure on the lower portions of the loops 20 formed in the wire element. However, at the upper portion of the loop where the wire crosses itself, the wire is of double thickness and this portion is compressed between the die elements 24 and 26 to form flattened surfaces 46 at the tops of the loops. When the wire elements 12 are assembled side by side, as illustrated in FIGURE 4, the spacing between these wire elements is determined by the extent to which the wire elements have been compressed at the point of cross-over in the loops. It will be understood, of course, that the thickness of the wire element at the point of cross-over in the loops determines only the minimum separation between wire elements. Where a greater separation is desired, washers or shims can be used to increase the separation, as is well known in the art.

FIGURE 5 illustrates the cross sectional shape of the wire elements at the point where a protuberance 40 has been formed in a recess 34 of one of the coining dies. Due to the slope of the working face of the coining punch on one die, and due to a complementary slope in the recess 34 on the opposite die, the coined wire element has a converging taper from top to bottom, as shown in FIGURE. 5.

FIGURE 6 illustrates the cross section at a point intermediate the protuberances 40 where both sides of the wire elements have been acted on by the working face of a coining punch. Here, again, since the coining punches are sloped in a complementary manner, the wire element has a converging taper from top to bottom. Thus, at substantially all points along the length of the formed wire element 12, except at the loops 20 therein, the wire elements have a downwardly converging cross sectional shape. This feature is highly desirable in screening surfaces for the reason that it permits particles which pass through the minimum thickness of the slots in the screen to fall freely through a diverging gap. Since the point of minimum thickness of the slots is near the top working surface of the screen, particles which cannot pass through the slots are held at the top of the screen where they can be carried off the screen by the flow of material passing thereover.

From the foregoing description, it will be apparent that the method disclosed provides a means for forming a sinuously undulated wire element after loops have been formed in the wire element and without damage to the loops. As clearly appears in FIGURE 4, the wire elements formed with the method of the present invention cooperate to produce a uniform slot dimension in a marcelled screen formed from the wire elements, the slot being sinuously undulated so as to minimize the passage of platelets or slivers through the screen.

In FIGURE 4 it will be noted that the undulatory crests in one wire element project partially between the undulatory crests of the adjacent wire element, thus precluding even the thinnest of slivers or platelets from passing through the screen if the overall length of the platelets exceeds one-half the undulatory wave length of the wire element. Due to this characteristic, it is also apparent that the spacing between wire elements can be increased with the aid of shims or washers, so as to increase the slot width of the screen without materially increasing the probability that slivers or platelets will pass through the screen. A single set of coining dies may be used to produce wire elements capable of satisfying a comparatively wide range of slot widths.

It will occur to those skilled in the art that the character of the undulations in the wire elements 12 may be varied by adjusting the size of the coining punches 32 in the coining dies 24, 26. In the coining dies illustrated, the punches 32 have a width greater than the width of the recesses 34 therebetween. Thus the opposing punches 32 in the dies 24 and 26 overlap and do not interdigitate. However, if the punches 32 are made narrower, with a consequent increase in the spacing between the punches, it is possible to produce coining dies with punch elements which interdigitate, thereby enhancing the undulating character of the wire elements. However, it is found that for screen requirements in most commercial installations, a slot width ranging from one to six millimeters is required and this range can be covered without interdigitating punch elements.

Although the preferred embodiment of the device and method of making same has been described, it will be understood that within the purview of this invention various changes may be made in the form, details, proportion and arrangement of parts, the combination thereof and mode of operation, which generally stated consist in a device capable of carrying out the objects set forth, as disclosed and defined in the appended claims.

Having thus described my invention, I claim:

1. The method of making marcelled screen structures, said method utilizing elongate wire elements and a pair of coining dies, each die supporting spaced coining punches disposed in linear array in the face thereof, said method including the steps of forming equally spaced loops along the length of a plurality of said wire elements, coining each said wire element intermediate each pair of loops therein with said coining dies, said coining dies being arranged in face to face relation with the coining punches in the opposing faces thereof disposed in staggered overlapping relation whereby a sinuous configuration is imparted to each wire element coined therebetween, and securing said plurality of coined wire elements in side by side relation with the loops therein juxtaposed and with the sinuously coined portions thereof in nesting relationship.

2. The method according to claim 1, wherein said wire elements are initially of circular cross section and wherein the coining punches in the faces of said die elements have substantially flat working surfaces, said method including the step of inclining the working surfaces in one coining die relative to the working surfaces in the other prior to said coining step whereby the wire elements, when coined, have a tapered cross section and, when assembled side by side, establish diverging slots therebetween.

3. In the method of making marcelled screen structures the steps of applying pressure simultaneously to diametrically opposite sides of the wire element at spaced intervals along the length of said wire element to compress said wire element at said spaced intervals thereby extruding metal from said wire element at said spaced intervals to form spaced protuberances in said wire element between said spaced intervals, there being one protuberance formed between each pair of said spaced intervals, and simultaneously with said pressure application guiding alternate of said protuberances to one side

of said wire element and guiding the intermediate of said protuberances to the opposite side of said wire element.

4. The method according to claim 3 including the simultaneous step of pressing said wire element in a direction transverse to the direction of said diametric pressure application to produce a flattened longitudinal surface in said wire element disposed between said diametrically opposite sides of said wire element.

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