

July 29, 1952

J. E. SOCKE
METHOD AND APPARATUS FOR TREATING
ARTICLES WITH JETS OF FLUID

2,605,091

Filed April 13, 1948

4 Sheets-Sheet 1

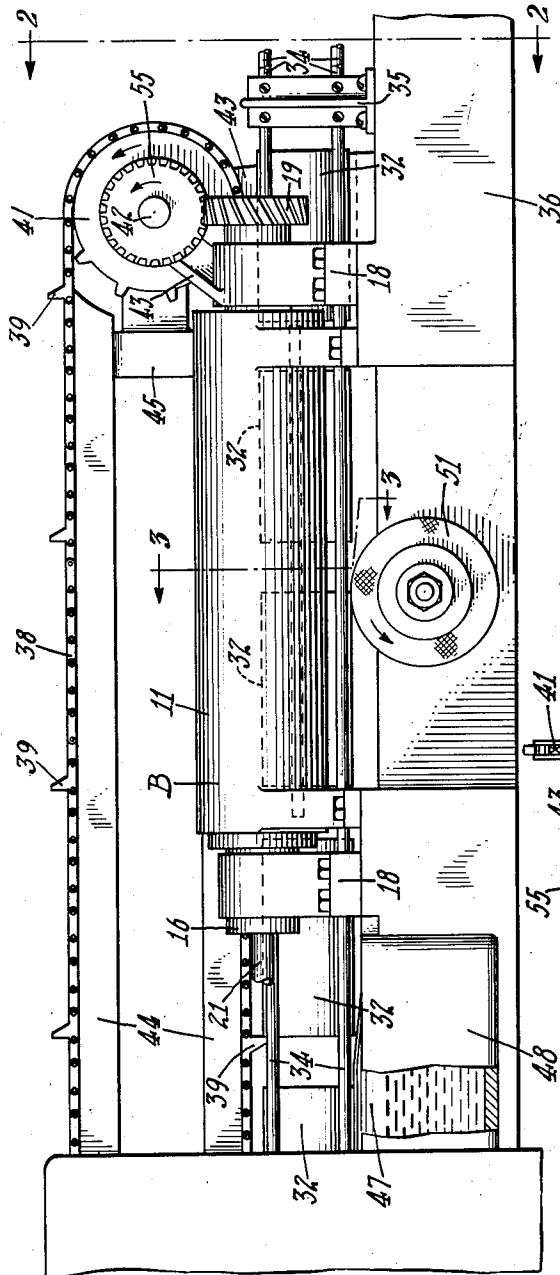
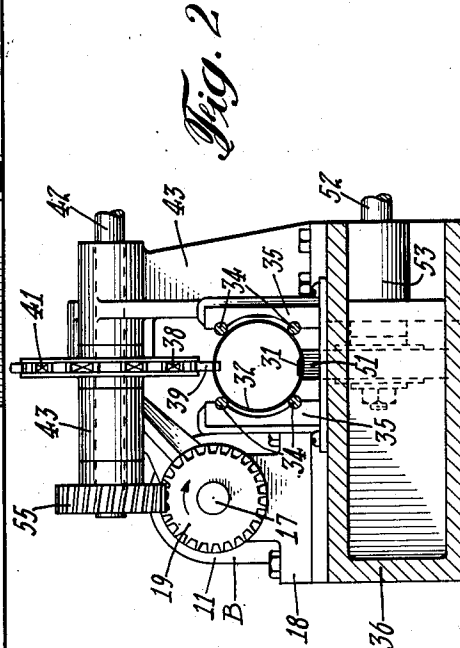


Fig. 1



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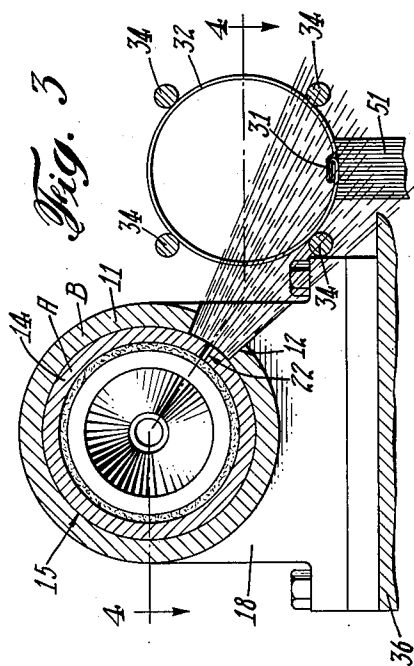


Fig. 3

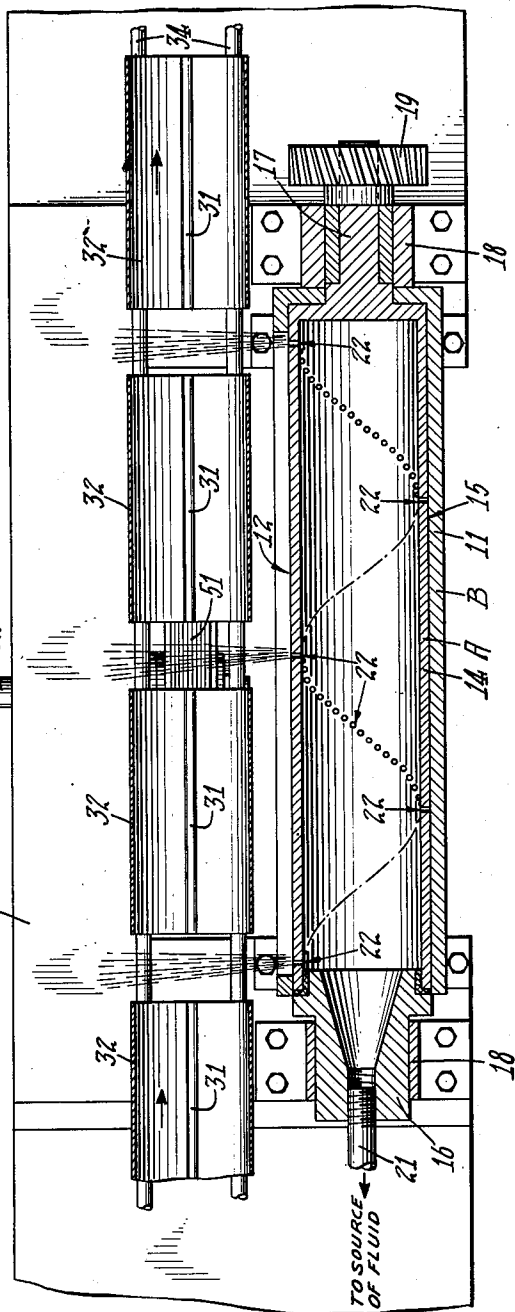


Fig. 4

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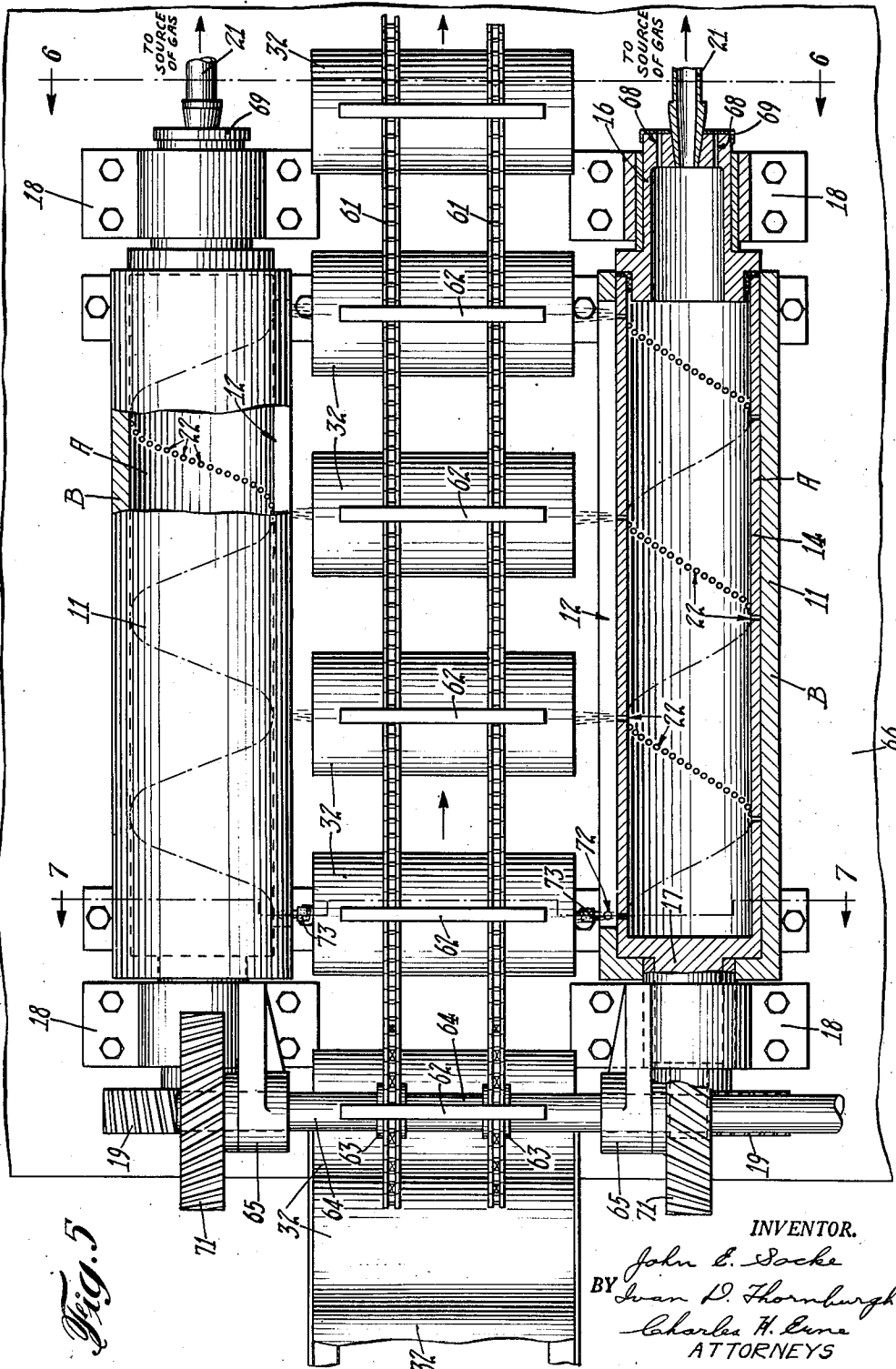
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Fig. 7

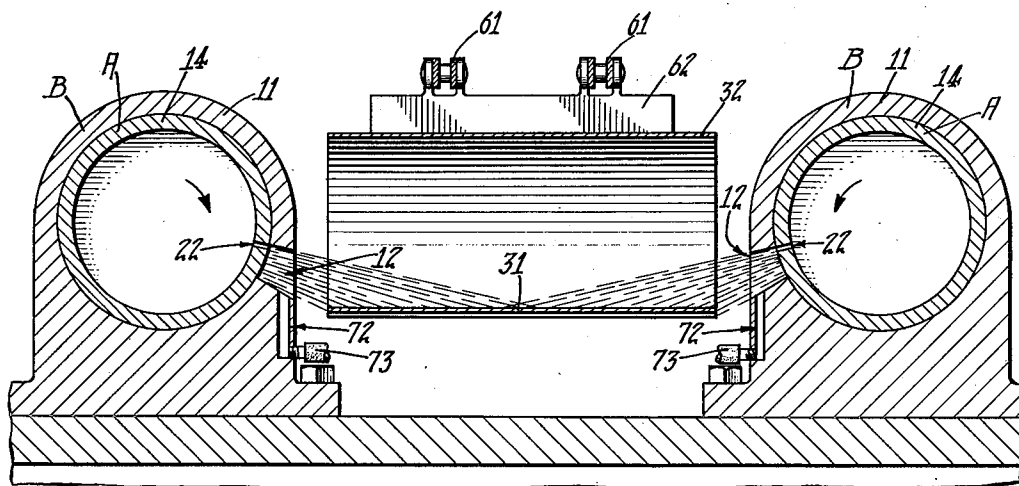
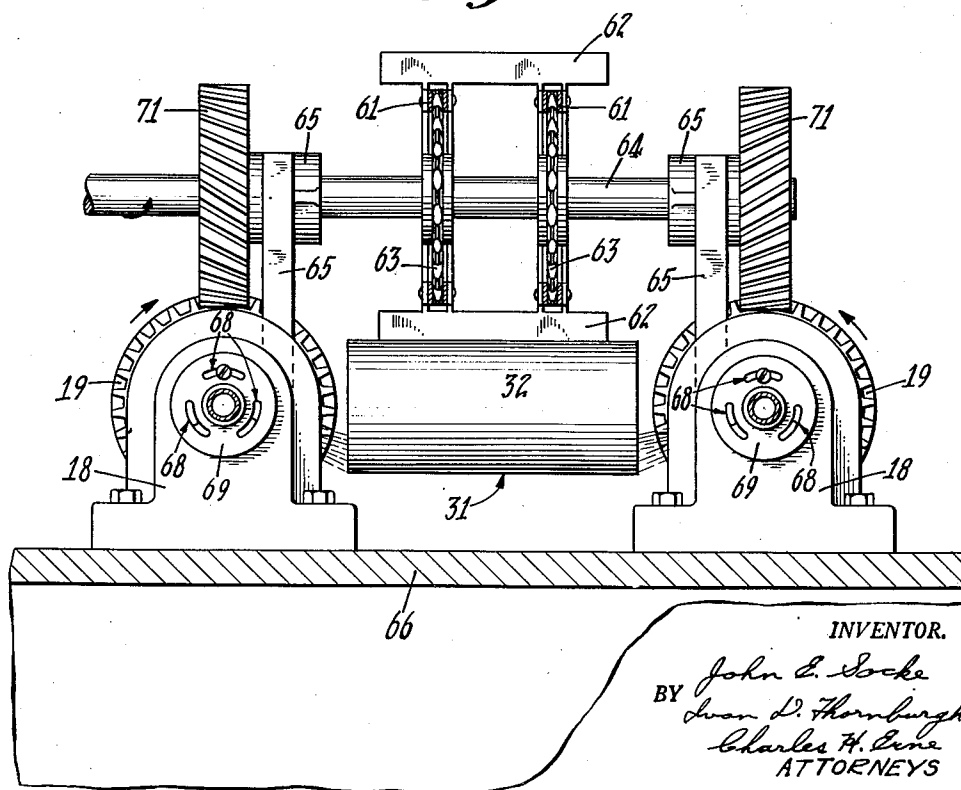


Fig. 6



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2,605,091

METHOD AND APPARATUS FOR TREATING
ARTICLES WITH JETS OF FLUID

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8 Claims. (Cl. 263—9)

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The present invention relates to a method of and apparatus for operating upon or treating articles with a fluid and has particular reference to creating and projecting a jet or stream of fluid in a predetermined direction and along a controlled path of travel, through the medium of a pair of cooperating members having relative movement.

An object of the invention is the provision of a method of and apparatus for treating articles wherein a jet of fluid may be made to move along a predetermined path of travel and in a predetermined direction relative to an article of manufacture for operating upon the article or a restricted portion thereof.

Another object is the provision of such a method of and apparatus for treating articles wherein the jet of fluid may be used for heat treating, or cooling, or coating an article or a restricted portion thereof or may be used for protecting the article against extraneous materials and/or may be used for a variety of other purposes.

Another object is the provision of such a method of and apparatus for treating articles with a jet of fluid which is simple and novel, is readily adapted to various uses and modes of operation, and is highly variable and flexible as to timing, spacing and measuring of the jet of fluid.

Numerous other objects and advantages of the invention will be apparent as it is better understood from the following description, which, taken in connection with the accompanying drawings, discloses a preferred embodiment thereof.

Referring to the drawings:

Figure 1 is a side elevation of an apparatus embodying the instant invention and for carrying out the method steps of the invention, with parts broken away and parts shown in section;

Fig. 2 is a sectional view taken substantially along the line 2—2 in Fig. 1, with parts broken away;

Fig. 3 is an enlarged sectional view taken substantially along the broken line 3—3 in Fig. 1, with parts broken away;

Fig. 4 is a horizontal section taken substantially along the broken line 4—4 in Fig. 3, and turned through an angle of 90 degrees, with parts broken away;

Fig. 5 is a modified form of apparatus embodying and for carrying out the method steps of the instant invention, with parts broken away and parts shown in section; and

Figs. 6 and 7 are transverse sectional views taken substantially along the respective lines 6—6, 7—7 in Fig. 5, with parts broken away.

As a preferred and exemplary embodiment of the instant invention the drawings illustrate a method of and an apparatus for creating and projecting a jet or stream of fluid in a predetermined direction and along a controlled path of travel for treating or operating upon articles through the medium of a pair of cooperating inner and outer members comprising an inner rotatable member A (Figs. 3 and 4) and an outer stationary member B although this order of arrangement may be reversed, or both the inner and outer members may be movable relative to each other.

The outer stationary member B preferably comprises a hollow cylindrical housing 11 constituting a jet directing element and is formed with a longitudinal slot 12. This slot may be straight, or irregular in shape longitudinally, and in width, may be uniform or varied to control the direction and the volume of the jet of fluid in accordance with the result desired. More than one slot may be provided if desired.

The inner rotatable member A preferably comprises a hollow cylinder 14 which is closed at its ends and rotatably disposed in a bore 15 formed in the housing 11. This cylinder constitutes a jet creating or forming element. The ends of the cylinder are formed with trunnions 16, 17 which extend beyond the housing and which are journaled in bearing brackets 18. The trunnion 17 carries a gear 19 for suitably rotating the cylinder 14. The opposite trunnion 16 is hollow and is connected to a supply pipe 21 which leads from a suitable source of fluid under pressure and which conveys the fluid into the cylinder 14.

The cylinder 14 is formed with a plurality of closely spaced apertures or orifices 22 which are arranged in a line around the cylinder and which communicate with the fluid filled interior of the cylinder. This line of apertures may be a true helix or may be of any other desired shape or may be continuous or interrupted. In some cases more than one line of apertures may be used and these may be parallel lines or nonparallel lines. The apertures may be of uniform diameter or may be graduated or may be in groups of different diameters for creating jets of fluid of various volumes.

Hence as the cylinder 14 rotates within the housing 11, the apertures 22 in the cylinder are rotated past the slot 12 in the housing and during this rotation one or more of the apertures

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are in register with the slot, excepting when the line of apertures is of the interrupted form. Thus when an aperture is in register with the slot 12, the fluid under pressure within the cylinder is forced outwardly, in the form of a jet or stream and the direction of projection of this jet or stream is controlled by the position and the width of the slot.

Since the line of apertures extends around the cylinder 14 one or more turns in a helix or an irregular form of a helix, the apertures rotate into register with the slot in succession and hence successive apertures register with the slot in advanced or retarded positions in accordance with the helical shape of the line. Thus the jet of fluid which issues from the slot is substantially continuous and moves along the slot in either direction in accordance with the helical shape of the line of apertures. When the slot or the line of apertures is interrupted or broken the jet or stream of fluid is temporarily cut off. Thus the jet or stream of fluid may be made to flow continuously or interruptedly along a predetermined longitudinal path of travel extending for the full length of the housing 11.

Where more than one slot 12 in the housing 11 is used a plurality of jets may be obtained and their projection may be in the same or different directions. Variations in the widths of the slots 12 may be used to control the volumes of the jets at different places along their path of travel. In case a multiplicity of lines of apertures in the cylinder 14 are used or where the lines of apertures extend around the cylinder 14 for more than one turn, a plurality of jets of fluid may be created simultaneously in spaced relation and may be made to follow each other in succession if desired. The size of the apertures in the cylinder 14 may also be made to gradually increase or decrease the volume of the jets of fluid or may be made to alter this volume in any desired proportion. This novel arrangement of housing slots and cylinder apertures lends itself to a great variety and flexibility of different combinations of useful functions.

The fluid may be a liquid or a gas and where the gas is combustible it may be ignited and projected as a flame. In practical application the projected fluid may be utilized for treating or operating upon articles of manufacture, as by coating, heat treating, cooling and various other treatments.

One such exemplary application of the instant invention is disclosed in Figs. 1, 2, 3 and 4 of the drawings, which illustrate principal parts of a machine for soldering side seams 31 of tubular sheet metal container or can bodies 32 which are open at both ends. In this treatment of the can bodies, a jet or stream of fluid, in this case compressed air, is projected across the spaced ends of the can bodies to prevent solder pellets or other foreign matter from entering and contaminating the interior surfaces of the bodies during the usual side seam wiping operation which removes excess solder from the side seam following the soldering operation.

In the soldering machine (Figs. 1, 2 and 4) the can bodies 32 are advanced in spaced and timed order in a continuous procession, along a straight line path of travel while being supported by a plurality of horizontally disposed longitudinal guide bars 34 which constitute a conventional outside horn. These guide bars 34 are secured to spaced brackets 35 bolted to a frame 36 which constitutes the main frame of the machine.

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The can bodies 32 are propelled along the horn 34 by an endless chain conveyor 38 having spaced feed dogs 39 secured thereto for propelling the bodies. This conveyor is disposed above and extends along the horn 34. The conveyor is actuated continuously by a rotatable sprocket 41 mounted on a driving shaft 42 journaled in bearing brackets 43. One of the brackets 43 is bolted to the machine frame 36 and the other is formed integrally with one of the brackets 18. The driving shaft 42 is rotated in any suitable manner. The longitudinal runs of the conveyor are supported by and are backed up by rails 44 supported on an extension 45 of one of the brackets 43.

Soldering of the side seams 31 of the can bodies 32 is effected while the bodies move along the horn 34. For this purpose the side seams 31 of the moving can bodies pass along, in contact with, a conventional solder roll 47 (Fig. 1) which is rotated in any suitable manner in a bath 48 of molten solder. The rotating solder roll 47 carries the molten solder up onto the side seams of the passing bodies and thus seals the seams.

Excess solder is removed from the soldered seams 31 by a rapidly rotating wiper wheel 51 (Figs. 1 and 2) which is disposed adjacent the path of travel of the can bodies 32 and which engages the freshly soldered seams as the bodies move past the wiper wheel. The wiper wheel is mounted on a shaft 52 which is journaled in a bearing 53 formed on the machine frame 36 and which is rotated continuously in any suitable manner.

In this machine, the housing 11 of the fluid projecting apparatus is bolted to the machine frame 36, in a position adjacent the wiper wheel 51 and disposed parallel with and extending along the path of travel of the can bodies 32 moving along the horn 34. The projecting slot 12 in the housing 11 is straight and of uniform width and is disposed adjacent and parallel with the path of travel of the can bodies.

The line of apertures 22 in the cylinder 14 is disposed within the housing 11 (Fig. 4) is continuous and describes a true helix of several turns around the cylinder. This helix has a pitch equal to the spacing of the can bodies 32 moving in a procession along the horn 34. The apertures 22 preferably are of uniform diameter and are equally spaced. The cylinder 14 is initially set so that an aperture 22 when in register with the slot 12 in the housing 11 is also in alignment with the space between the can bodies 32 on the horn. The cylinder 14 is continuously rotated in time with the lineal travel of the can bodies along the horn, by a helical gear 55 which is mounted on the outer end of the conveyor drive shaft 42 and which meshes with and drives the gear 19 provided on the trunnion 17 of the revoluble cylinder 14.

Thus, as the can bodies 32 advance along the horn 34 in the region of the wiper wheel 51, the jet forming cylinder 14 rotates in synchronism with the travel of the bodies and thus brings the apertures 22 individually and successively into register with the slot 12 of the housing 11. As each aperture registers with the slot and is thus uncovered, a jet or stream of compressed air, from the interior of the cylinder, issues from the uncovered aperture and is projected into the adjacent space between the traveling can bodies and across the open ends of the bodies. The slot 12 in the housing 11 is positioned to control the direction and spread of this projected jet

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and to direct it across the region traversed by the side seams of the bodies as best shown in Figs. 3 and 4.

Before one uncovered aperture leaves the slot 12 a succeeding aperture enters the slot and thus a continuous jet of compressed air issues from and travels along the slot in time with the lineal travel of the bodies and in the same direction of movement of the bodies. There is one of these jets of air projected from the slot for each turn of the helix of apertures in the cylinder 14. Thus there is one jet for each space between the can bodies for the full extent of the housing 11.

In this manner, the jets of compressed air travel with the spaces between the bodies and maintain a continuous stream of air through these spaces without impinging upon the bodies. These continuous streams of air block off the open ends of the bodies and impinge against and divert any solder pellets or other foreign matter that may be thrown off by the rotating wiper wheel 51 located below the bodies. The solder pellets and other foreign matter are thus diverted or blown away from the bodies and are thus prevented from entering and contaminating the interior surfaces of the bodies.

Another exemplary application of the instant invention is disclosed in Figs. 5, 6 and 7 of the drawings, which illustrate principal parts of a machine for heat treating the side seams 31 of the can bodies 32. In this treatment of the can bodies a traveling flame of ignited combustible gas, such as illuminating gas is projected onto the side seams of the bodies and maintained in position as the bodies move in an orderly procession along a path of travel.

In this machine the can bodies 32 are carried along a straight line path of travel by a pair of spaced and parallel endless chains 61 comprising a conveyor carrying a plurality of spaced and parallel permanent bar magnets 62 disposed transversely of the conveyor for carrying transversely disposed can bodies in spaced and parallel relation with their open ends facing a pair of spaced mechanisms embodying the instant invention. Each magnet carries one body with its side seam disposed at the bottom of the body.

The chains 61 operate over a pair of spaced sprockets 63 which are mounted on a drive shaft 64 which is continuously rotated in any suitable manner. The drive shaft is journaled in bearing brackets 65 formed on the bearing brackets 18 bolted to a frame 66 which may be the main frame of a more elaborate machine. The chains extend beyond the instant machine for carrying the treated bodies to any suitable place of deposit.

This machine is equipped with two of the fluid jet projecting housings 11, each having revolubly disposed therein a cylinder 14. These housings are located one on each side of the machine, extending along the chain conveyor in parallelism therewith, and with their jet directing slots 12 facing the open ends of the moving can bodies. These slots are straight and parallel with the path of travel of the bodies and are of uniform width. In this machine the fluid supply pipe 21 leads from a suitable source of the combustible gas. Adjacent the cylinder end of this pipe, the cylinder trunnion 16 is provided with air inlet channels 68 and an adjustable regulator plate 69 so that proper mixture of the gas and air may be had to support combustion.

The lines of apertures 22 in the cylinders 14 disposed within the housing 11 are continuous

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and describe a true helix of several turns, the helix having a pitch equal to the spacing of the can bodies 32 moving in the procession of bodies carried by the conveyor. The apertures 22 preferably are of uniform diameter and are equally spaced. The two cylinders 14 are initially set so that corresponding apertures 22 of each cylinder when in register with the slots 12 in the housings 11 are also in alignment with opposite ends of the side seam of a can body (see Fig. 5). The two cylinders 14 are continuously rotated in opposite directions and in time with each other and with the lineal travel of the can bodies, by helical gears 71 which are mounted on the conveyor drive shaft 64 and which mesh with and drive the gears 19 provided on the trunnions 17 of the cylinders 14.

Thus as the can bodies 32 advance along their path of travel, in the direction of the arrow shown in Fig. 5, the two jet forming cylinders 14 rotate in synchronism with each other and with the bodies and thus rotate the apertures 22, of each cylinder, individually and successively into register with the slots 12 of the housings 11. As each pair of apertures register with the slots and are thus uncovered, a pair of jets or streams of gas, from the interior of the cylinders, issue from the uncovered apertures and are immediately ignited and thus a pair of flames are projected inwardly and downwardly against the inner surface of the side seam 31 of a can body 32. The two flames, issuing from opposite directions, cover the entire length of the side seam as best shown in Figs. 5 and 7.

Ignition of the initial jets of gas is effected by a pair of pilot flames. There is one pilot flame for each cylinder 14 and it is located at the starting end (at the left as viewed in Fig. 5) of the slot 12 in the housing 11. This pilot flame burns continuously and is supported by gas issuing from a pilot channel 72 formed in the housing 11. The outlet end of the channel terminates in the slot 12. The inlet end communicates with a tube 73 which leads from any suitable source of the gas.

Before one uncovered aperture 22 leaves its slot 12 a succeeding aperture enters the slot and the new jet of gas thus created is ignited from the existing flame and thus a continuous traveling flame is provided which moves along the slot 12 in the same direction as and in time with a moving can body. There is one of these flames projected from the slots 12 for each turn of the helix of apertures in the cylinders 14. Thus there is one flame from each cylinder for each can body. In this manner the flames travel with the can bodies and remain in projected position against the side seams of the bodies until the bodies travel past the ends of the housings 11 thereby moving out of range of the slots 12. Thus the seams receive their heat treatment while moving along the lengths of the slots 12.

With such a fluid jet forming or creating and jet directing or projecting apparatus it will be appreciated that many other forms of treatment of articles may be performed. This invention is also applicable where the jet follows the motion of the work or follows along a predetermined area of work which remains stationary.

For treating the interior surfaces of tubular articles, the jet projecting apparatus may be located within the moving articles and may serve as a mandrel or horn for supporting them during treatment. In some cases the apparatus may be used for articles that remain stationary, the mov-

ing jet of fluid being directed onto or adjacent the article along any desired shape of path of travel for effecting a predetermined treatment.

It is thought that the invention and many of its attendant advantages will be understood from the foregoing description, and it will be apparent that various changes may be made in the form, construction, and arrangement of parts of the apparatus mentioned herein and in the steps and their order of accomplishment of the process described herein, without departing from the spirit and scope of the invention or sacrificing all of its material advantages, the apparatus and process hereinbefore described being merely a preferred embodiment thereof.

I claim:

1. In a machine for operating upon or treating articles with a fluid, the combination of feeding means for moving along a predetermined path of travel a plurality of articles arranged in spaced and timed order in a continuous procession, a housing disposed adjacent said feeding means and having an elongated slot therein extending along said path of travel of the articles, a cylinder rotatably disposed in said housing and having a plurality of jet forming apertures disposed in its outer surface and arranged around said cylinder in a predetermined position which corresponds with the spacing of the articles for projecting jets of fluid therefrom, said cylinder being set in said housing so that an aperture when in register with said slot is aligned with a space between a pair of adjacent articles in the procession, and actuating means operable in time with the movement of said articles for rotating said cylinder to bring said apertures successively into register with said slot in time with the movement of said articles and thereby producing a traveling jet of fluid projecting into a space between two adjacent articles and movable along said slot in time with and in the same direction of movement of said articles for maintaining said projecting jet of fluid in the space between the moving articles for treatment of the articles.

2. In a machine for operating upon articles with a fluid, the combination of feeding means for moving along a predetermined path of travel a plurality of articles arranged in spaced and timed order in a continuous procession, a housing disposed adjacent said feeding means and having an elongated slot therein extending along said path of travel of the articles, a cylinder rotatably disposed in said housing and having a plurality of jet forming apertures disposed in its outer surface and arranged in a helical line extending around said cylinder with a pitch equal to that of the spacing of the articles for projecting jets of fluid therefrom, said cylinder being set in said housing so that an aperture when in register with said slot is aligned with an article in the procession, actuating means operable in time with the movement of said articles for rotating said cylinder to bring said apertures successively into register with said slot in time with the movement of said articles and thereby producing a traveling jet of fluid projecting against said article and movable along said slot in time with and in the same direction of movement of said article for maintaining said projecting jet of fluid in alignment with the moving article, and ignition means disposed adjacent the end of said slot for igniting the jets of fluid as they are projected through said slot for producing a traveling flame retained in position against the moving article for heat treating said article.

3. A method of protecting articles from deposit of foreign material on a surface thereof by creating a protecting barrier between adjacent articles as they are advanced along a predetermined path of travel, comprising the steps of providing a series of fluid projecting valvular orifices adjacent said article path of travel, successively moving said orifices toward said path of travel, opening said orifices in succession as each orifice comes opposite the path of travel of the articles, projecting a fluid from an opened and positioned orifice into the space between adjacent advancing articles, and timing the positioning and the opening of each orifice with the advancement of said articles to maintain an advancing protecting barrier between the advancing articles.

4. In a machine for operating upon or treating articles with a fluid, the combination comprising feeding means for moving an article along a straight line path of travel, a housing disposed adjacent said feeding means and having a straight line slot therein extending parallel with said path of travel of said article, a hollow cylinder rotatably disposed in said housing and receiving and holding a supply of said fluid, said cylinder having a row of jet forming apertures cut through its peripheral wall and arranged along a helical line for projecting jets of fluid successively through said housing slot and actuating means connected in timed relation with said feeding means for rotating said cylinder on its axis within said housing to bring said apertures successively into register with the slot in said housing to open the apertures while moving preceding apertures out of register to close the apertures, thus producing a progressively advancing succession of jets of fluid moving as a straight line along said slot and in unison with said advancing article.

5. A method of treating moving articles with cooperatively moving fluid, which comprises moving an article along a predetermined path of travel, providing a series of fluid projecting valvular orifices along said predetermined path of travel, successively moving said orifices toward and away from said path of travel, opening each of said orifices in succession as it aligns with said path, closing said orifices as they move away from said path, supplying fluid to said valvular orifices for discharge from the open orifices, and timing the opening of said orifices with the movement of said article to produce in effect a moving jet of fluid discharging from successive orifices and moving along with each article for fluid treating the article as it passes along said path of travel.

6. A method of treating moving articles with a flame of burning fluid traveling with the articles, which comprises moving an article along a straight line path of travel, providing a series of combustible fluid projecting valvular orifices arranged in a helical line having a longitudinal axis parallel to the straight line path of travel of said article and rotatable on the axis of said helix, opening said orifices in succession as an orifice comes adjacent a moving article, confining said open orifices to a straight line coinciding with said path of travel, projecting a combustible fluid from the open orifices against a moving article in said path, igniting said combustible fluid as each orifice is opened, and timing the opening and closing of said orifices, the ignition of said combustible fluid and the extinction of the resulting flame projected therefrom producing a straight line of flame moving from one orifice to the next

and moving with the moving article for treating the article as it passes along said path of travel.

7. In a machine for operating upon or treating articles with a fluid, the combination of feeding means for moving along a predetermined path of travel a plurality of articles in a continuous procession, a housing disposed adjacent said feeding means, said housing having an elongated continuous slot therein extending along said path of travel of the articles, a hollow cylinder rotatably disposed in said housing and having a plurality of jet forming apertures disposed in its outer surface and arranged around said cylinder in a predetermined position which corresponds with predetermined treating points on said articles for projecting jets of fluid upon said treating points, said cylinder being set in said housing so that an aperture when in register with said slot is aligned with a treating point of a said article in the procession, and actuating means operable in time with the movement of said articles for rotating said cylinder to bring said apertures successively into register with said slot in time with the movement of said articles and thereby producing a traveling jet of fluid projecting upon a treating point of said article and movable along said slot in time with and in the same direction of movement of said article for treatment of the articles.

8. In a machine for operating upon articles with a fluid, the combination of feeding means for moving along a predetermined path of travel a plurality of articles arranged in spaced and timed order in a continuous procession, a housing disposed adjacent said feeding means and having an elongated continuous slot therein extending along said path of travel of the articles, a cylinder rotatably disposed in said housing and having a plurality of jet forming apertures disposed in

its outer surface and arranged in a helical line extending around said cylinder with a pitch equal to that of the spacing of the articles for projecting jets of fluid therefrom, said cylinder being set in said housing so that an aperture when in register with said slot is aligned with an article in the procession, and actuating means operable in time with the movement of said articles for rotating said cylinder to bring said apertures successively into register with said slot in time with the movement of said articles and thereby producing a traveling jet of fluid projecting against said article and movable along said slot in time with and in the same direction of movement of said article for maintaining said projecting jet of fluid in alignment with the moving article.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
901,757	Utard	Oct. 20, 1908
1,077,985	Jackson	Nov. 11, 1913
1,185,889	Eberhart	June 6, 1916
1,364,121	Leyland	Jan. 4, 1921
1,769,839	Jacobson	July 1, 1930
2,132,303	Lathrop	Oct. 4, 1938
2,194,433	Schorck	Mar. 19, 1940
2,257,605	Hartley	Sept. 30, 1941
2,495,055	Crowe	Jan. 17, 1950

FOREIGN PATENTS

Number	Country	Date
368,592	France	Oct. 11, 1906