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WIRE FORM TIE AND APPARATUS FOR MAKING SAME

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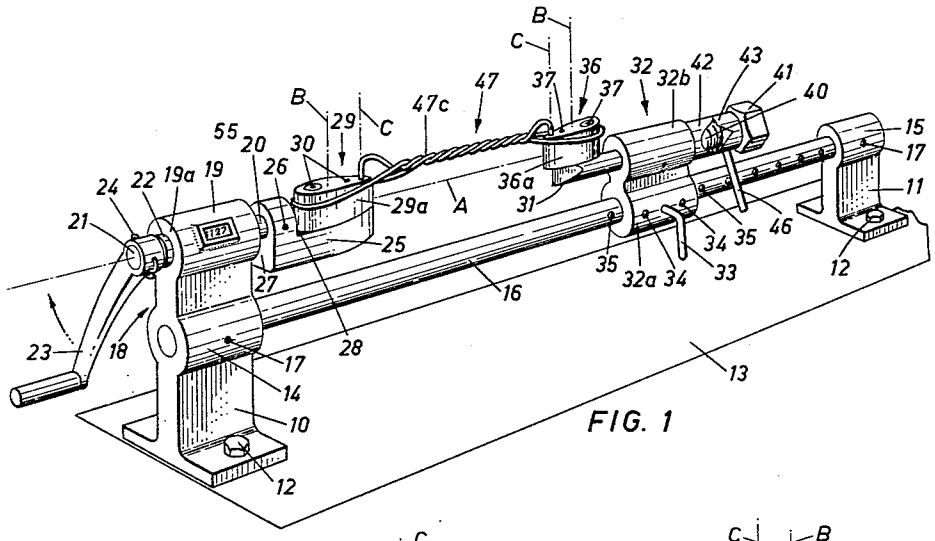


FIG. 1

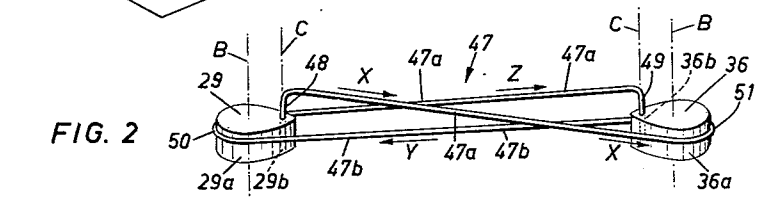


FIG. 2



FIG. 3

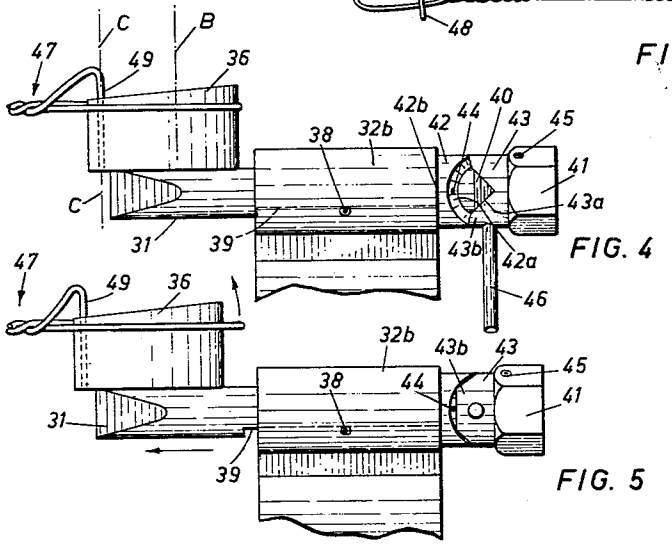


FIG. 4

FIG. 5

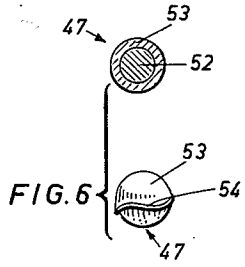


FIG. 6

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WIRE FORM TIE AND APPARATUS FOR MAKING SAME

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This invention relates to a structural form bracing wire tie adapted to present rustproof ends and to a machine for twisting said ties to any desirable length.

The ties presently in use provide braces for wooden forms and loop portions fashioned to hold the walls of the form in place prior to pouring the concrete, if such is the structural material being used.

The method of controllably forming ties having loop portions suitable for this purpose, as found in the art, is unduly complicated and adds to the overall cost of the tie, in addition to the cost of the machine used in the forming thereof.

The extreme tension produced in prior machines during the twisting operation is a factor inherent in the art which does not afford a simple means of releasing the tie after formation.

Upon setting of the concrete and cutting of the upright supporting portion of prior ties to remove the structural forms and clipping the protruding portion of existing wire ties flush with the exterior surface of the newly set wall, the ends of the ties become rusted and after a short length of time rust streaks appear on the external surface of the wall.

Existing tie forming machines are not easily adaptable to produce ties having various lengths without complicated adjustments and expensive mechanisms to produce variable lengths of ties.

The invention overcomes the disadvantages of prior methods in providing a release mechanism for simple removal of a form tie, and an adjusting means to provide ties of varying lengths. The inherent disadvantage of prior ties is overcome by the use of aluminum-clad wire as the tie forming material. Another advantage of the present invention resides in the provision of a form-abutting portion initially provided in the anchoring of the wire before twisting to produce a complete tie in one operation, from a single length of wire.

A preferred embodiment of the invention is indicated in the following drawings in which:

FIGURE 1 is a perspective view of the tie forming machine bearing a twisted wire tie according to the invention, prior to release;

FIGURE 2 is a view in perspective of the head of the machine indicating the means of attaching the wire prior to the twisting operation;

FIGURE 3 is a broken view of the complete tie;

FIGURE 4 indicates a side elevation of a portion of the machine to an enlarged scale before release of the tie;

FIGURE 5 indicates a side elevation of a portion of the machine in release position after the twisting operation.

FIGURE 6 is a cross-sectional view of a wire in accordance with the invention before cutting and a view of a wire end after cutting thereof.

Having regard to the drawings a preferred embodiment of the machine of the invention comprises support members or legs, **10** and **11**, adapted to be fastened by bolts **12** to any suitable supporting surface **13**. Legs **10** and **11** have extended reinforcing sections, **14** and **15** respectively of predominantly circular cross-section, each section being drilled to receive the end portions of a bed member **16**, the bed member retaining the legs in a spaced apart relationship for support and stability. The end portions of the bed member are rigidly maintainable within

the enlarged portions of the legs by means of set screws **17** threadably insertable through the legs and into the end portions of the bed member **16**. It may readily be seen that other suitable means may be employed for retaining the bed member within the legs, however the set screws provide a simple means of disassembly for easy portability.

Leg **10** includes an upwardly extending portion generally indicated by the reference numeral **18** to provide a bearing portion **19** adapted to receive a shaft **20** adapted to rotate within the said bearing portion. One end **21** of shaft **20** has inserted thereover a collar **22** of sufficient outside diameter to abut the exterior face **19***a* of bearing **19**. The portion of shaft **20** adjacent end **21** is threaded to receive a handle **23** held rigidly to said threaded portion of the shaft by means of a pin **24** insertable through the handle and the shaft, in a manner well known to an experienced mechanic. Collar **22** is fixed in position on the shaft by any suitable means such as brazing or welding.

The free end of the shaft remote from the handle is inserted through bearing portion **19** toward leg **11** until collar **22** abuts the exterior face of bearing **19**. Shaft **20** is of sufficient length to protrude through the bearing and the free end of the shaft is engageable with yoke **25**, the yoke being bored to receive the shaft, the yoke and shaft being held in relatively fixed relationship by means of set screw **26**. The yoke is preferably fixed to the shaft in a position to provide a portion of said shaft between surface **27** of the yoke and the interior face of the bearing portion **19**, to permit a restricted lateral sliding movement of the shaft within said bearing, said movement being restricted in one direction by contact of collar **22** with the exterior face **19***a* of bearing **19** and in the other direction by contact of surface **27** of yoke **25** with the interior face of bearing **19**.

Yoke **25** is provided with a recessed flat surface portion **28** for engagement with a loop chucking head **29**, held in fixed relationship with the yoke on surface **28** by means of a set screw **30**.

The body of head **29**, having a head axis shown in broken line and denoted by the letter B, is preferably generally ovoid in lateral cross-section as clearly indicated in FIGURES 1 and 2. The external surfaces of the head form loop defining surfaces **29***a* disposed parallel to the head axis B for purposes hereinafter set out. Head **29** is drilled as indicated in broken line by the reference **29***b* to form a socket or wire end anchorage to receive a clamping leg of a length of wire prior to the formation of a wound tie, the socket having an axis C parallel to axis B.

Surface **28** of the yoke is sufficiently recessed to provide optimum positioning of the head **29** on the projection of the centre-line of shaft **20** to permit a minimum eccentricity of head **29** upon rotation of said shaft. The centre-line of shaft **20** and its projection forms a machine axis noted in broken line in FIGURE 1 by the letter A.

Horizontally opposed to shaft **20** is a release arm **31** slidably inserted within a supporting arm **32** slidably engageable with bed member **16** to dispose the release arm **31** in an end-to-end parallel relationship to the rotatable shaft **20** as shown in FIGURE 1.

Support arm **32** in vertical cross-section is shaped generally in the form of a figure **8** with the lower rounded portion **32***a*, FIGURE 1 being drilled to receive bed member **16**, and the upper rounded portion **32***b* being drilled to slidably receive the release arm **31**. The supporting arm **32** may be adjustably located upon bed member **16** by means of a removable pin **33** insertable into holes **34** of member **32** and holes **35** of bed member **16**. Holes **34** have a closer relative spacing than that of holes **35** to permit a fine linear adjustment of member **32** on member **16**.

A second loop chucking head or wire supporting portion **36** is directly supported upon release arm **31** by means of set screws **37**, or other suitable means, as indicated in FIGURE 1. Though it has not been found necessary, it may be convenient to provide a machined flat portion of the release arm to provide a seat for the second head member **36** for fixed engagement with the release arm.

The chucking head **36** is supported upon spindle **31** to dispose the head substantially centrally upon the machine axis A of the device. Head **36** is identical in form to head **29**, having a body axis B, loop defining surfaces **36***a* disposed parallel to the body or head axis, and a drilled portion **36***b* forming a socket or wire end anchorage to receive a clamping leg of a length of wire. The socket **36***b* contains axis C parallel to axis B, said axes B and C of heads **29** and **36** being disposed substantially at right angles to the machine axis A.

The release arm **31** is prevented from rotation within rounded section **32***b* of support arm **32** by means of the engagement of set screw **38** with a shoulder of release arm **31** formed by a flat surface **39** machined upon a portion of the arm **31**, the set screw **38** being retained within portion **32***b* of support arm **32** as shown in FIGURES 4 and 5.

The outward end of release arm **31**, a portion of which is indicated by the reference numeral **40**, is threaded to receive an internally threaded nut **41**, FIGURES 1 and 4. A collar **42** having arcuate cut-away portions **42***a* is adapted to freely engage arm **31**. A flat surface **42***b* of collar **42** abuts the outer vertical surface of the rounded section **32***b* of supporting arm **32** as clearly shown in FIGURES 4 and 5. Sleeve **43**, slidably engageable with release arm **31** has edges **43***a* defining V-shaped cut-away portions providing an extended lug portion **43***b*.

Collar **42** is adapted to be held rigidly to support **32** by means of locking pins **44**. The nut **41** is threadably engageable with the threaded portion **40** of arm **31** and may be held in position against turning by means of set screw **45** through a wall of the nut as shown in FIGURES 4 and 5 engaging the arm. A pin **46**, FIGURES 1 and 4 is attached to sleeve **43** by welding, brazing or other suitable means, a protruding portion of pin **46** being provided externally of said sleeve for manual operation of the sleeve as part of a releasing mechanism.

The wire to be twisted into a form tie is generally designated in FIGURES 1, 2 and 3 by the reference numeral **47** and as shown in FIGURE 2 comprises a single wire having end portions **47***a* and an intermediate length **47***b* all of substantially equal lengths. Upon twisting of the tie the portions **47***a* and **47***b* form a rigidifying intermediate cable portion **47***c*, FIGURES 1 and 3. The end portions are bent near their extremities to form clamping legs **48** and **49** for insertion within sockets **29***b* and **36***b* of heads **29** and **36** respectively, effectively anchoring said ends. In the twisted condition, clamping legs **48** and **49** form abutments for structural materials such as wooden boards or other material used as forms in the construction of poured concrete or other types of walls.

Upon formation of a twisted wire tie, loop portions **50** and **51** are provided, each loop receiving a clamping leg **48** and **49** respectively through the crotch of the loop emerging from each end of the twisted intermediate cable portion **47***a* of the tie, said legs forming a board abutment means.

It may be readily appreciated that many types of wires may be used in the formation of the tie. However, for purposes hereinafter set out, and as shown in FIGURE 6, a wire **47** having a steel core **52** is preferred, with an aluminum coating **53** to form an aluminum clad steel wire. Upon cutting the aluminum clad wire, a pinched or crimped end is developed as shown in FIGURE 6, in which the aluminum portion of the cut end completely

encloses the steel portion, the higher ductility of the aluminum forming a clad end **54**.

In operation, the end portion or clamping leg **48** of a piece of wire of suitable length is inserted within the drilled socket or anchorage **29***b* of head **29**, FIGURE 2, and the wire is bent roughly at right angles to form the downwardly extending clamping leg. The wire is then wound around head **36** in the direction of arrows X and thence in the opposite direction toward head **29** following arrow Y, and forming loop **51**. Upon winding the wire around head **29**, thus forming the loop **50**, the wire is returned in the direction of arrow Z to insert end portion or clamping leg **49** within the drilled socket or anchorage **36***b* of head **36**, the wire being positioned substantially on the machine axis A. It is preferable in operation to provide the bent portions forming both clamping legs in this manner before attaching the wire to the chucking heads.

The placing of the wire on the machine having been completed, head **36** on release arm **31** is urged outwardly, sleeve **43** being rotated to dispose the extended lug portion **43***b* from cooperation with the arcuate cut-away portion **42***a* of collar **42**. In this manner, heads **29** and **36** are fixed in a pre-determined spaced apart relationship, the distance depending on the length of tie desired. Spacing of the heads is accomplished by sliding the supporting arm **32** to a required location on bed member **16**, and inserting pin **33** into proper communicating holes **34** and **35**. Upon winding the tie, pin **46** rigidly attached to sleeve **43**, is rotated to allow insertion of lug portion **43***b* within arcuate portion **42***a* of collar **42**. The tension produced by winding the tie is thus released by relative movement of head **36** on release arm **31** toward head **29**, permitting removal of the wound tie as clearly indicated in FIGURES 4 and 5.

A revolution counter **55** is inserted within the bearing portion **19** of support **10** for engagement with shaft **20**. The counter is adjusted before assembly with the shaft to indicate a numerical change of one upon four complete rotations of said shaft to provide an indication of the number of ties so formed, since four rotations are sufficient to complete the tie-winding operation.

In accordance with known practice in the use of form ties, loops **50** and **51** contain an upright bar or other structural member to support the finished concrete form. Upon pouring and setting of the concrete, to remove the structural form, the ties are cut to permit removal of the boards and upright supports, the portions of ties within the inner faces of the boards being retained within the concrete for re-inforcing purposes.

The aluminum clad portion of the inventor's tie, upon cutting of the wire provides a protective coating **53**, over the steel core of the wire and the crimped end **54** preventing the appearance of rust streaks on the outer face of the finished wall.

It will be obvious from a study of the invention that changes or modifications may be incorporated therein without departing from the principles and spirit thereof and for this reason it is not meant to limit the invention to the precise arrangement and formation of the parts except as claimed.

What I claim as my invention is:

1. Apparatus for forming a structural wire tie characterized by two end loop portions and a clamping leg extending transversely through each end loop portion, from a single length of wire, and comprising in combination: a machine bed having a bed axis extending longitudinally through said apparatus; a longitudinal axis parallel to said bed axis about which the wire tie is to be formed; two loop chucking heads; means supporting said chucking heads to dispose the axis of each at right angles to said longitudinal axis and in spaced apart relation on the latter, the heads being spaced apart on said longitudinal axis a distance substantially equal to the length of the tie to be formed; a loop defining surface on each head parallel to said head axis and a wire end

anchorage on each head in the form of a socket having an axis parallel to said head axis and adapted to accommodate a wire end to define a clamping leg for said wire tie therein; said loop defining surfaces being located outwardly of said head axes and said sockets being located inwardly of said loop defining surfaces; means for rotating one of said heads on said longitudinal axis; means rigidly anchoring the other head on said longitudinal axis during rotation of said first head thereby to form a twisted intermediate cable portion from a single length of wire, the ends of which are accommodated in said sockets and the loop portions of which are defined by said loop defining surfaces of said chucking heads; and releasable means for slidably moving said other head axially on said longitudinal axis to accommodate removal of said wire tie from said chucking heads.

2. Apparatus for forming a structural wire tie characterized by two end loop portions and a clamping leg extending tarnsversely through each end loop portion, from a single length of wire, and comprising in combination: a machine bed having a bed axis extending longitudinally through said apparatus; a longitudinal axis parallel to said bed axis about which the wire tie is to be formed; two loop chucking heads; means supporting said chucking heads to dispose the axis of each at right angles to said longitudinal axis and in spaced apart relation on the latter; each head being substantially ovoid in cross-section a loop defining surface on each head parallel to said head axis; a wire end anchorage on each head in the form of a socket having an axis parallel to said head axis and adapted to accommodate a wire end to define a clamping leg for said wire tie therein; and said loop defining surfaces being located outwardly of said head axes and said sockets being located inwardly of said loop defining surfaces; means for rotating one of said heads about said longitudinal axis; and means rigidly anchoring the other head on said longitudinal axis during rotation of said first head thereby to form a twisted intermediate cable portion from a single length of wire the ends of which are accommodated in said sockets and the loop portions of which are defined by said loop defining surfaces of said chucking heads.

3. Apparatus as claimed in claim 1 in which the releasable means comprises: a collar having arcuate cutaway portions; a sleeve having extended portions adapted in one position to be retained from the arcuate portions of the collar and in the other position to engage said arcuate portions; and means engaging the head support to permit sliding of said other head axially on said machine axis upon engagement of the extended portion of the sleeve within the arcuate position of the collar.

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